

SHIVAKI

WALL MOUNTED SPLIT-TYPE AIR CONDITIONERS

SERVICE MANUAL

No.TE121023

Models

SSH-I304BE/SRH-I304BE



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IMPORTANT NOTICE

This service manual is intended for use by individuals possessing adequate backgrounds of electrical, electronic and mechanical experience. Any attempt to repair the appliance may result in personal injury and property damage. The manufacturer or seller cannot be responsible for the interpretation of this information, nor can it assume any liability in connection with its use.

The information, specifications and parameter are subject to change due to technical modification or improvement without any prior notice. The accurate specifications are presented on the nameplate label.

How to order spare parts

To have your order filled promptly and correctly, please furnish the following information:

1. Model No. with Indoor or Outdoor
2. No. in the Explosion View
3. Part Name
4. The quantity you ordered

Summary and features



Panel Z



For fixed type

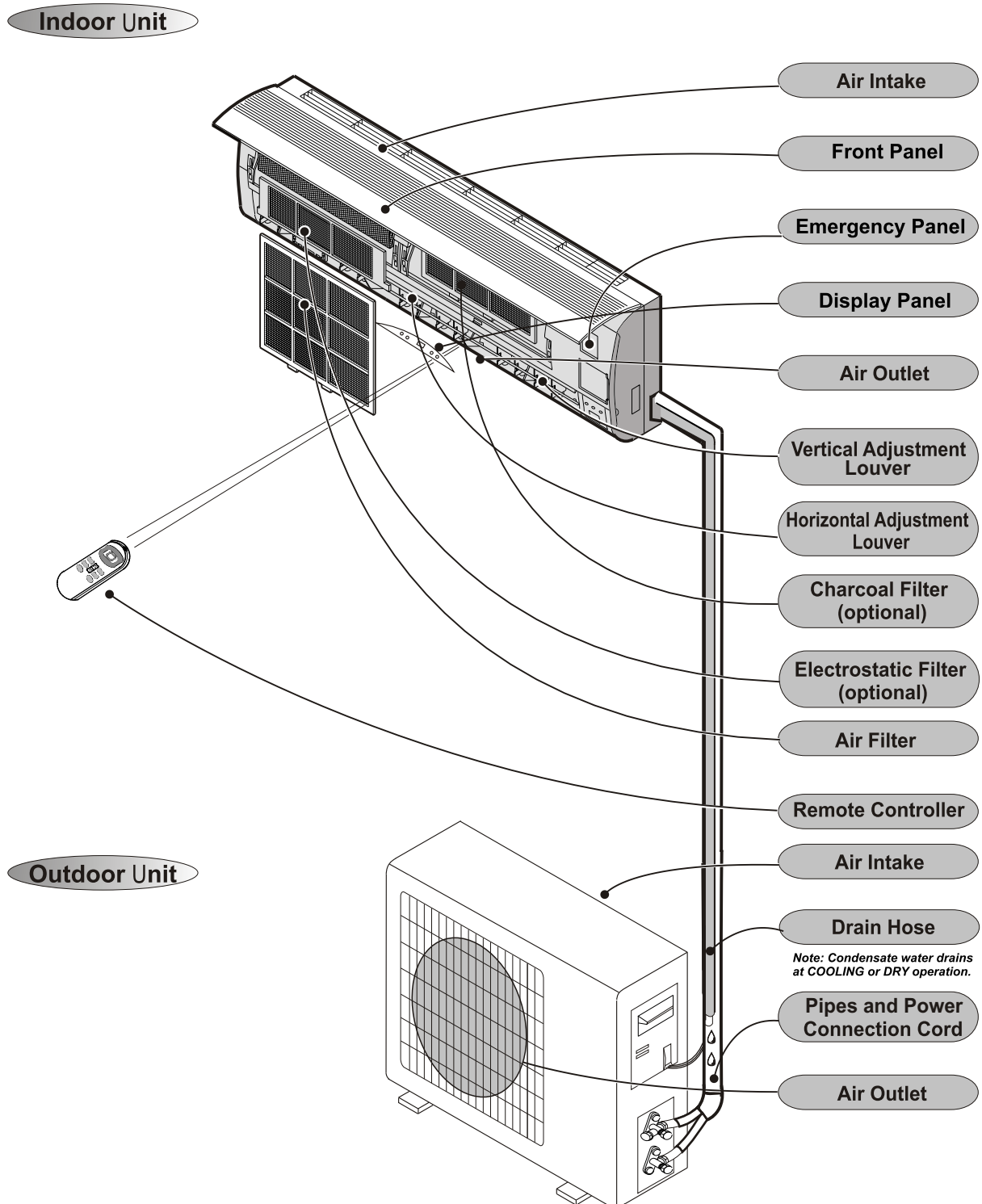


Models	Remarks
SSH-I304BE/SRH-I304BE	Fixed type (220~240V/50Hz)

Technical Specifications

Model No.			SSH-I304BE/SRH-I304BE	
Type			Heating Pump	
Control type			remote	
Rated cooling capacity		Btu/h;W	28000; 8205	
Rated heating capacity		Btu/h;W	28500; 8350	
EER for cooling		Btu/h.w; W/W	3.02	
COP for heating		W/W	3.42	
Moisture removal		Liters/h	2.2	
Pressure	High(DP)	MPa	4.5	
	Low(SP)	MPa	1.9	
Indoor noise level at cooling	High	dB(A)		
	Med.	dB(A)	41	
	Low	dB(A)		
Outdoor noise level		dB(A)	58	
Electrical Data				
Power supply			220-240V~/50Hz/1P	
Voltage Range		V	198~264	
Rated current	Cooling	A	12.7	
	Heating	A	11.5	
Rated input	Cooling	W	2715	
	Heating	W	2445	
Annual energy consumption		kwh (cooling)	1357.5	
Refrigerating System				
Refrigerant/Charge		Gram	R410A/1720g	
Compressor	Type	Rotary		
	Model	PA270G2CS-4MU1		
	MFG	GMCC		
Evaporator		Hydrophilic & Louver Fin; Innergroover tube type (φ7)		
Condenser		Louver or Corrugated Fin; Innergroover tube type φ7		
Expansion device		Capillary tube		
Defrosting system		Microcomputer controlled reverse system		
Fan System				
Indoor air circulation(Cooling/Heating)		m³/h	1000	
Indoor fan type			Cross flow	
Indoor fan speed H/M/L	Cooling	rpm	1330/1230/1150	
	Heating	rpm	N.A	
	Dry	rpm	1150	
	Sleep	rpm	1150	
Indoor fan motor output		W	35	
Outdoor fan type			Propeller	
Outdoor fan speed		rpm	780	
Outdoor fan motor output		W	76	
Connections				
Connecting Pipe	Gas	Inches	5/8"	
	Liquid	Inches	3/8"	
Connecting Wiring	Size x Core number		0.75x4; 0.75x2	
Drainage Pipe			O.D 16mm	
Others				
Suitable area		m²	25~45	
Net dimensions (W x H x D)	Indoor	mm	1033x313x202	
	Outdoor	mm	902x650x307	
Net weight	Indoor	kg	14	
	Outdoor	kg	52	
Packing dimensions (W x H x D)	Indoor	mm	1103x400x300	
	Outdoor	mm	1037x705x433	
Gross weight	Indoor	kg	17	
	Outdoor	kg	57	

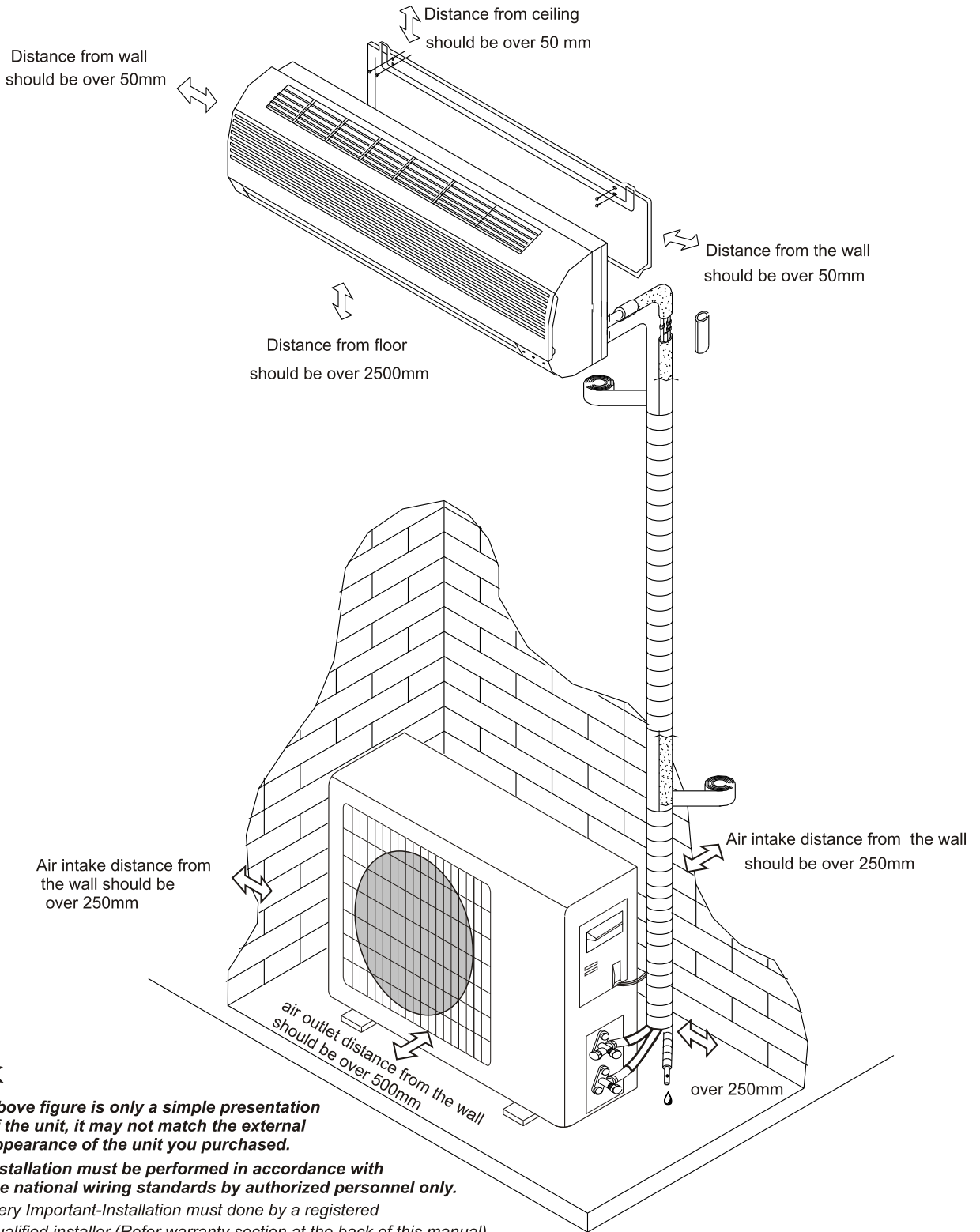
Identification of Parts



☑ The figures in this manual are based on the external view of a standard model.
Consequently, the shape may differ from that of the air conditioner you have selected.

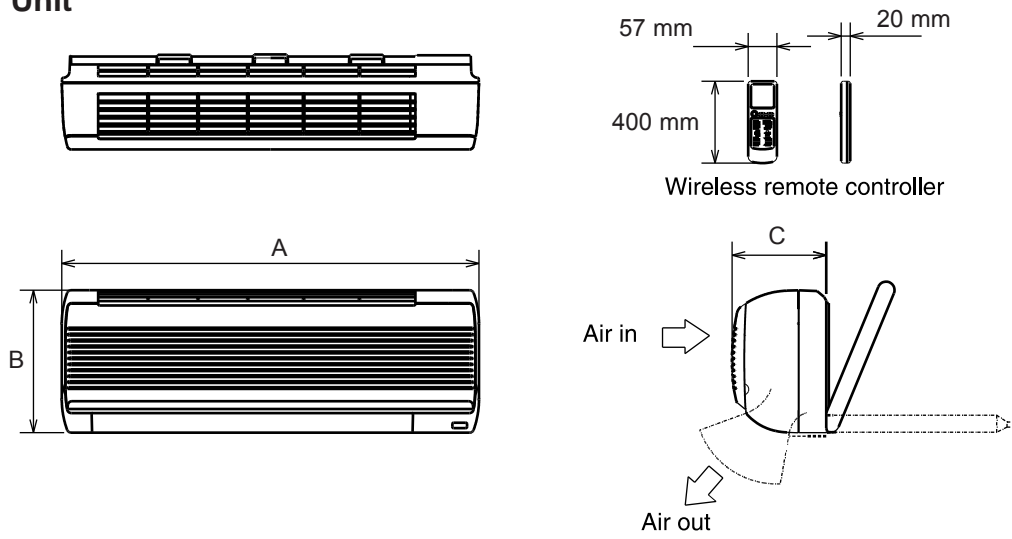
Installation Instructions

Installation Diagram

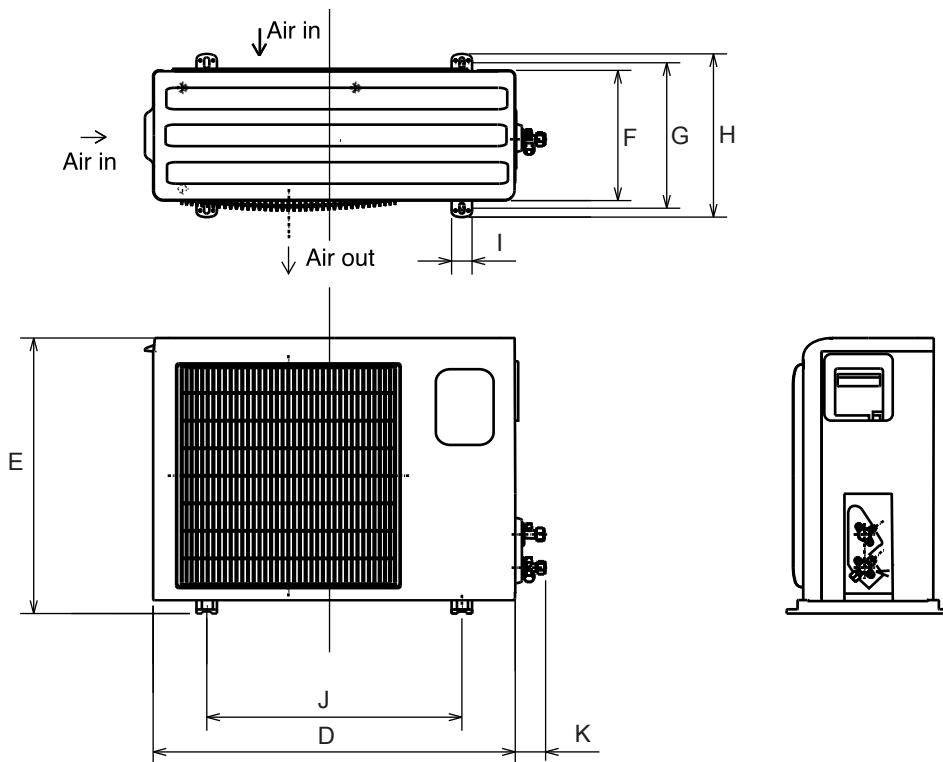


Product Dimensions

Indoor Unit



Outdoor Unit



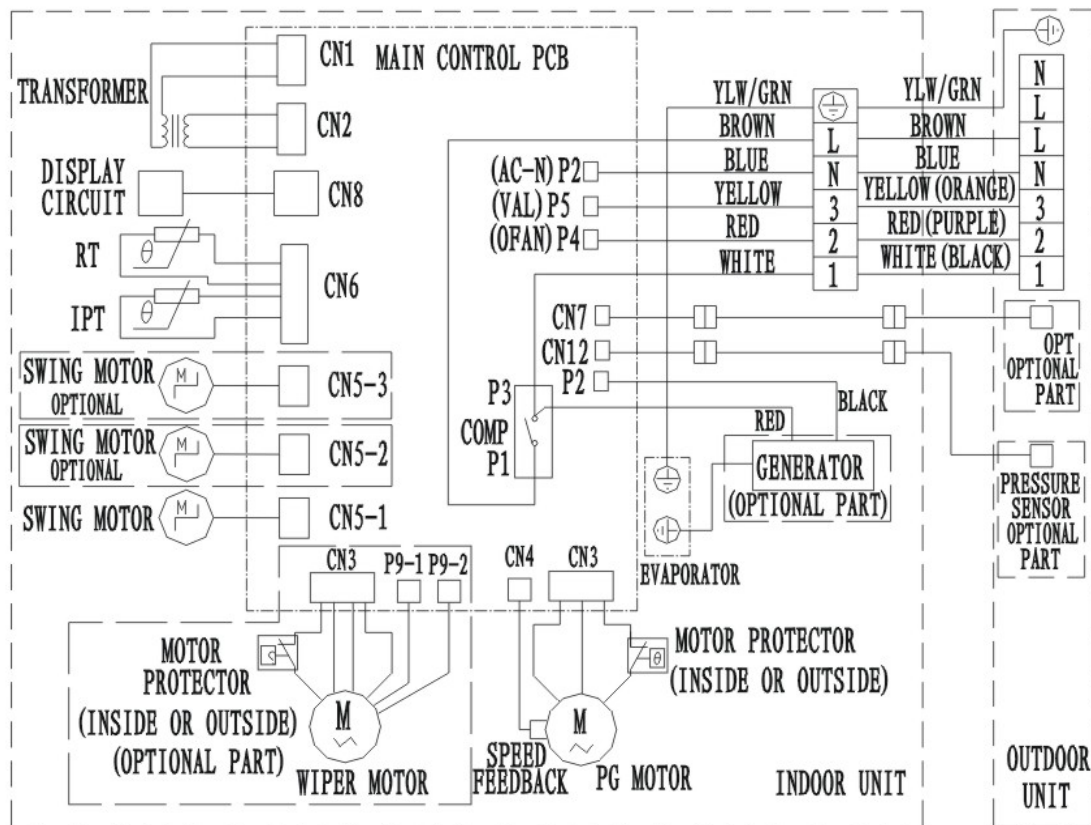
Unit: mm

Capacity	A	B	C	D	E	F	G	H	I	J	K
24K	1033	313	202	902	650	307	349	399	65	753.5	63

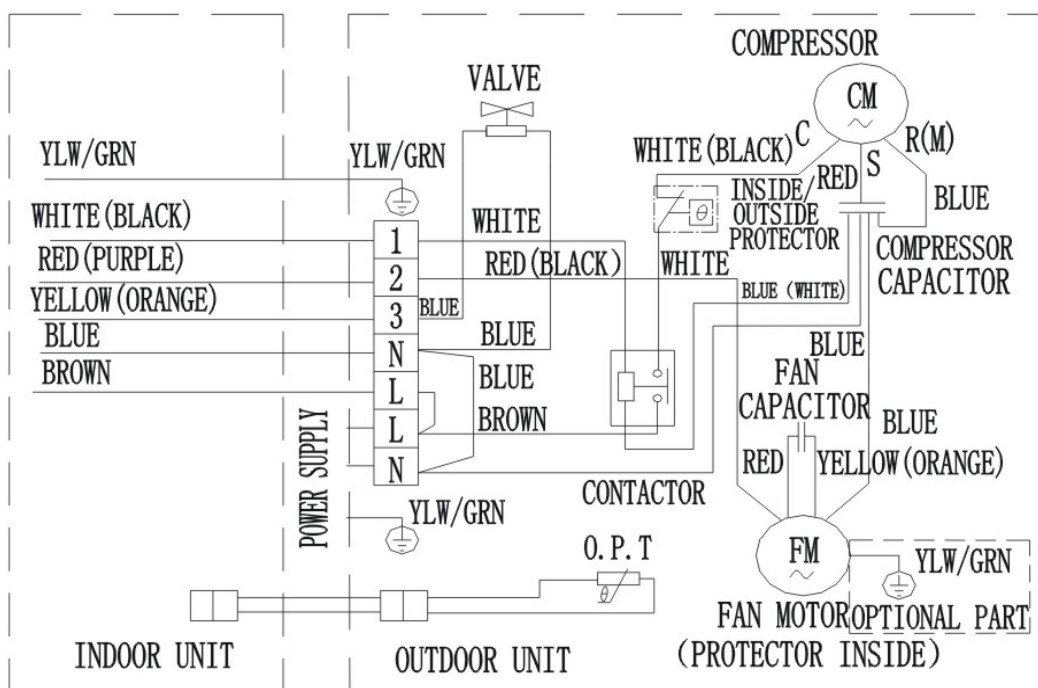
WIRING DIAGRAM

MODEL: SSH-I304BE/SRH-I304BE

INDOOR UNIT:

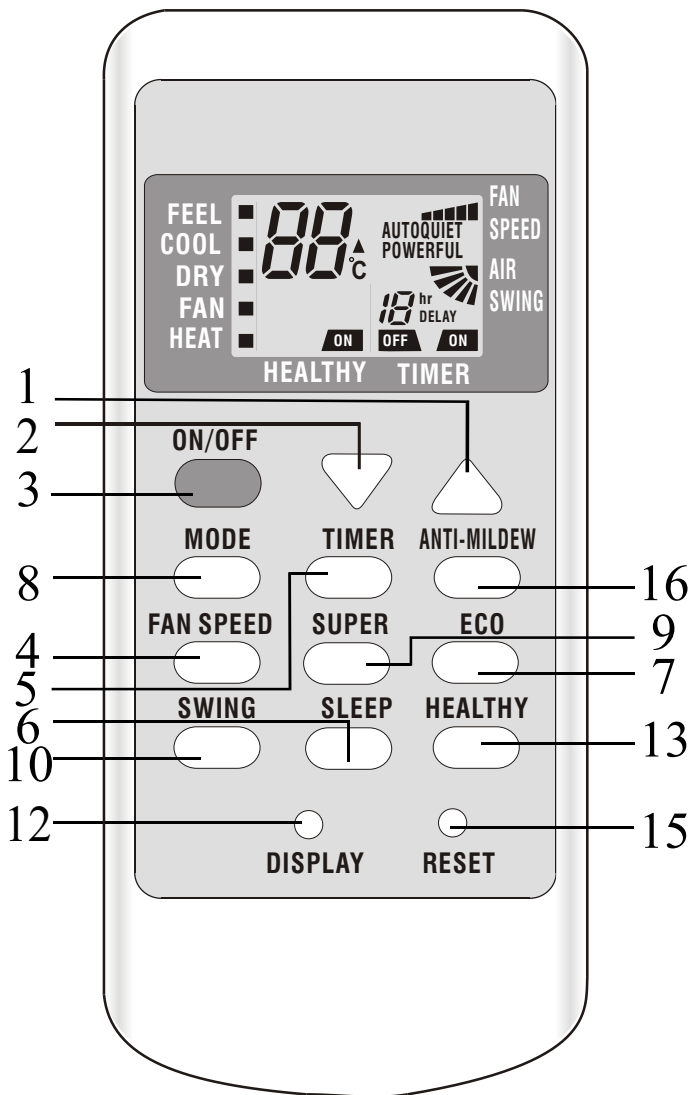


OUTDOOR UNIT



Operation Details

Remote controller



- 1 TEMP UP button**
Increase the temperature or time by 1 unit.
- 2 TEMP DOWN button**
Decrease the temperature or time by 1 unit.
- 3 ON/OFF button**
To switch the conditioner on and off.
- 4 FAN SPEED button**
To select the fan speed of auto/low/mid/high.
- 5 TIMER button**
To set automatic switching-on/off.
- 6 SLEEP button**
To activate the function "SLEEP".
- 7 ECO button**
In cooling mode, press this button, the temperature will increase 2°C on the base of setting temperature. In heating mode, press this button, the temperature will decrease 2°C on the base of setting temperature.
- 8 MODE button**
To select the mode of operation.
- 9 SUPER button**
In cooling mode, press this button, the unit will give the maximum cooling temperature with 16°C. In heating mode, press this button, the unit will give the maximum heating temperature with 31°C.
- 10 SWING button**
To activate or deactivate of the movement of the "DEFLECTORS".
- 12 DISPLAY button**
To switch on/off the LED display (if present).
- 13 HEALTHY button**
To switch - on /off HEALTHY function. It is a button which controls the ionizer or plasma generator only for inverter type.
- 15 RESET button**
To restart REMOTE CONTROL.

Note: Each mode and relevant function will be further specified in following pages.

Remote Control

The remote controller is not presetting as Cooling Only Air Conditioner or Heat Pump by manufacturer. Each time after the remote controller replace batteries or is energized, the arrowhead will flashes on the front of "Heat" or "Cool" on LCD of the remote controller.

User can preset the remote controller type depending on the air conditioner type you have purchased as follows:

Press any button when the arrowhead flashes on the front of "Cool", Cooling Only is set.

Press any button when the arrowhead flashes on the front of "Heat", Heat Pump is set.

If you don't press any button within 10 seconds, the remote controller is preset as Heat Pump automatically.

Note :

If the air conditioner you purchased is a Cooling Only one, but you preset the remote controller as Heat Pump, it doesn't bring any matter. But if the air conditioner you purchased is a Heat Pump one, and you preset the remote controller as Cooling Only, then you CAN NOT preset the Heating operation with the remote controller.

Electronic controller:**1. Automatic mode**

1) Initial RT determines the working mode and ST, the mode is determined effective only once unless A/C shut-down then re-started. If from other modes switches to autoamatic mode (including mode conversion after shutdown), it should be that the compress stop more than 3 min then temperature judgement and automatic mode are conducted (it can conduct immediately from fan mode switched to automatic, the indoor fan stops, three minutes later the response is made and start up). Within 3 min, the output as: Showing the room temperature, indoor fans starts (or anti-cold airflow), the outdoor fan stops;

2) With memory controller, once being turned off or in case of an accidently power cut, the A/C is able to retain and restore the original mode when being turned on or the power supply is resumed, if the auto restart function activated. power-down after power-on; while if the auto restart fundction isn't activated, the A/C enters standby state.

Heat pump

Mode	Initial RT	Initial ST
Cooling	$RT \geq 26^{\circ}\text{C}$	23°C
Dehumifying	$26^{\circ}\text{C} > RT \geq 20^{\circ}\text{C}$	18°C
Heating	$RT < 20^{\circ}\text{C}$	23°C

Cooling-only

Mode	Initial RT	Initial ST
Cooling	$RT \geq 26^{\circ}\text{C}$	23°C
Dehumifying	$26^{\circ}\text{C} > RT \geq 20^{\circ}\text{C}$	18°C
Ventilating	$RT < 20^{\circ}\text{C}$	—

Under automatic mode (including from automatic converted into dehumidifying Dry mode), when the temperature up and down signals from the remote controller is received, the setting temperature ST adjusts correspondingly to the current room temperature plus or minus 1°C , the automatic regulating temperature range is $\pm 2^{\circ}\text{C}$.

2. Cooling mode

1) The control of the compressor

- When $RT - ST \geq 1^{\circ}\text{C}$, the compressor is running.
- When $RT - ST < -1^{\circ}\text{C}$, the compressor is off.
- When $-1^{\circ}\text{C} \leq RT - ST < 1^{\circ}\text{C}$, the compressor keeps its original state.

2) Outdoor fan motor and the compressor run simultaneously (except for defrosting).

3) The control of indoor fan motor:

- Indoor fan motor can operate by automatic, low, middle, and high airflow speed circularly.
- Indoor fan motor's the automatic airflow speed control Indoor fan motor can operate by automatic, as shown in Figure 1:

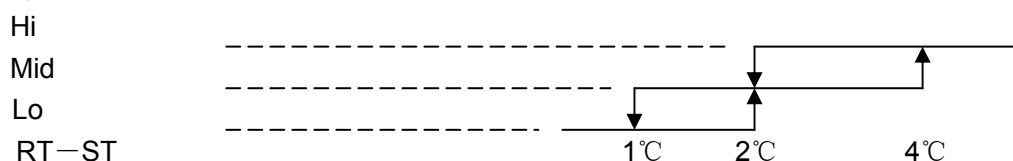


Figure 1 Cooling automatic airflow

When the temperature changes lead to changes in airflow speed, the switch can only be made orderly, and every grade of air flow speed runs 1 minute at least.

3, Dry mode

running into this mode, the Air cond. firstly operates for 3 minutes according to cooling mode (set temperature is 7°C), and then takes the detected backflow air temperature minus 2°C as a new set temperature (the minimum value of 5°C) and runs according to cooling mode, indoor fan operates at low-speed, at this moment the setting operation of Fan speed is invalid but Swing is adjustable.

4. Heating mode

On the Heating mode, the room temperature is repaired. After repaired, the room temperature display on the LED CRT= $\text{RT}-3^{\circ}\text{C}$.

1) The control of the compressor

a. When $\text{ST}-\text{CRT}\geq 1^{\circ}\text{C}$, the compressor is running.

b. When $\text{ST}-\text{CRT}<-1^{\circ}\text{C}$, the compressor is off.

c. When $-1^{\circ}\text{C}\leq\text{ST}-\text{CRT}<1^{\circ}\text{C}$, the compressor keeps its original state

2) Outdoor fan motor and the compressor run simultaneously (except for defrosting)

3) The control of indoor fan motor:

a. Indoor fan motor can operate by automatic, low, middle, and high airflow speed circularly.

b. indoor fan motor's the automatic airflow speed control Indoor fan motor can operate by automatic, as shown in Figure 2:

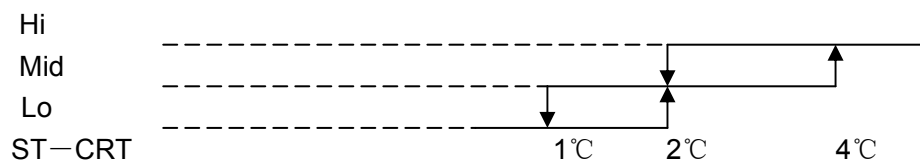


Figure 2 Heating automatic airflow

When the temperature changes lead to changes in airflow speed, the switch can only be made orderly, and every grade of air flow speed runs 1 minute at least.

4) Vane motor control: run as set state.

5) 4-way valve control:

a. Under heating mode, the four-way valve maintains well-connected status (including the compressor stops on set condition, but except for the defrosting process)

b. When the mode switches into the heating mode or start-up, four-way valves will open 5 Seconds before the compressor starts; while the mode exits from the heating mode or turn off, the four-way valve will close 2min after after the shut-down the compressor.

6) Defrosting function:

During defrosting, once mode switch, temperature setting signals received, and the buzzer and display make response immediately, but the other operations won't implemented until defrosting finished;

During defrosting, the signals of on-off, timing, sleep, airflow speed and swing will be responded, but the airflow speed and swing should be in accordance with anti-cold air rules.

Except the above signal processing during defrosting, no other signals will be dealt with, but only a loud buzz.

During defrosting, electrical heating stops compulsively.

Defrosting enter and exit program:

Option 1: with jumper JC

The condition of enter defrosting: run into defrosting once any of condition 1, 2, and 3 met.

Condition 1: As shown in figure 3

Defination:

The followings are all required to meet:

- $IPT1 = IPT_{max} - \Delta IPT$ (8°C)
- $t5 \geq 50\text{min}$ (running time $t5 \geq 50\text{min}$ (the compressor runs cumulatively) , $t5$ is removable, and could be less than $t1$)
- $IPT < 40^{\circ}\text{C}$, and lasts 2min.

Running into defrosting on condition 1, the first running time of set defrosting is F (8min); after running a defrosting cycle, the defrosting time should be determined and adjusted.

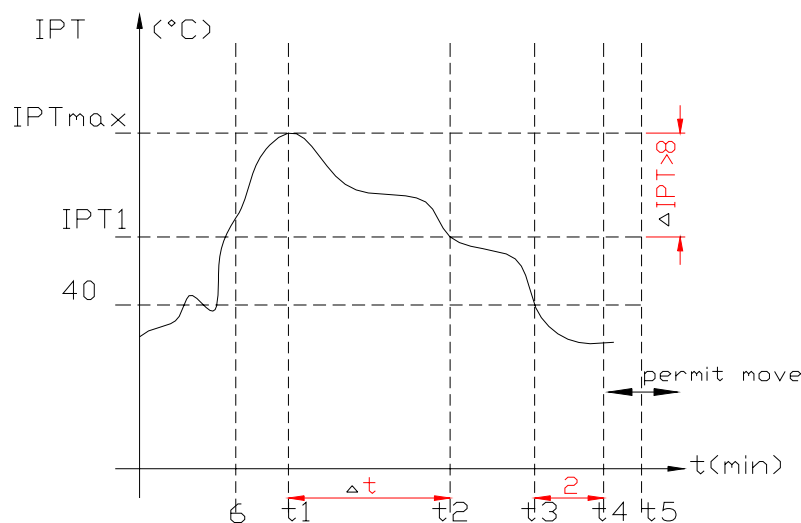


Figure 3

Condition 2: When running time is more than or equal to 120 min (compressor is running accumulatively), the indoor temperature is less than 35°C for 2 min sustained. Running into defrosting under condition 2, defrosting time set is 8 min.

Condition 3: after the compressor is operating for 20min continuously, the indoor temperature is less than 23°C which is anti-cold wind temperature when the fan stops running(including temperature dropping when compressor operating, not including the compressor's starting course), and the machine runs into defrosting according to any one condiciton as below) Running into defrosting under condition 3, defrosting time set is 10 min.

- Running into the first defrosting in 20 min after start-up.
- The interval from last defrosting equivalent to or more than 50 min (stopping the compressor or the machine in standby is allowed in the meantime).

Option 2: No Jumper JC, and no OPT outdoor sensor

when the compressor runs for 45 min, if the indoor coil temperature is less than 40°C for 2 min, the machine runs into defrosting, and lasts for 3min, otherwise when the compressor runs for 120 min, the machine runs into defrosting automatically and last for 10 min.

Option 3: No jumper JC, but with OPT outdoor sensor

When heating, when the temperature of outdoor unit under heat-exchange is lower than $E^{\circ}\text{C}$ (-4°C), and the compressor runs for 45 min, then the machine runs into defrosting and last for 10 min.

Option 4. When heating, when the outdoor fan motor stopped but the compressor not stopped

accumulative total 30min, then the machine runs into defrosting and last for 8 min. if the accumulative total less than 30min, but accord with one of the condition option 1-3 them the machine runs into defrosting at the option 1-3 and the accumulative total time restarts from 0.

Conditions for quitting defrosting

(1) The quitting conditions for option 1 and option 2, the machine quits from defrosting if any one below condition met.

a. Defrosting time is over.

b. When it runs in defrosting for three minutes, the IPT indoor coil temperature rises 15 ° C or above from the bottom point.

(2) The quitting conditions for option 3.

When $OPT \geq 20^{\circ}\text{C}$ or defrosting for more than 10 min, then quit from defrosting.

(3) Defrosting process shown in Figure 4

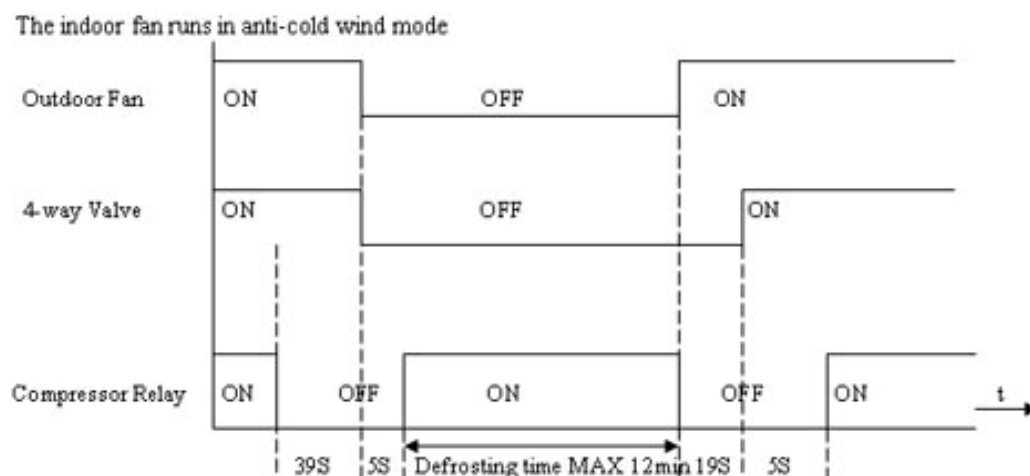


Figure 4 Defrosting process

7) Auxiliary Electric heating function

(1) The default condition is automatic on/off the electric heating function.

(2) The conditions of auxiliary electric heating(all the following conditions must be met)

a. the compressor runs for more than 3min;

b. indoor fan runs normally;

c. not in defrosting state;

d. auxiliary electric heating is turned off for more than 30s.

e. $ST-RT \geq 3^{\circ}\text{C}$;

f. $RT < 22^{\circ}\text{C}$;

g. $IPT \leq 43^{\circ}\text{C}$;

(3) The conditions of stopping auxiliary electric heating(any one of the following conditions met, the state stops)

a. the compressor stops

b. $RT \geq 24^{\circ}\text{C}$;

c. $IPT \geq 48^{\circ}\text{C}$

d. indoor fan stops.

e. running into sleeping function

5. Fan mode

1) Indoor fan motor control:

indoor fan motor is running at setting speed (the speed is same as that of heating).

2) Vane motor control: running according to the setting.

3) The outdoor unit is not working under fan mode.

6. Sleeping mode

1) Under sleep mode, the indoor fan motor is running at a low-airflow speed, except that the power light and sleep light are on, timer light is on/off according to the setting state, running light is off. LED is off after displaying 5min.

2) Temperature control:

(1) From cool mode to sleep mode, one hour later, the operates $\text{Temp.} = \text{ST} + 1$, another one hour later, the operates $\text{Temp.} = \text{ST} + 2$, after then unchanged.

(2) From heating mode to sleep mode, one hour later, the operates $\text{Temp.} = \text{ST} - 1$, another one hour later, the operates $\text{Temp.} = \text{ST} - 2$, after then unchanged.

3) the machine will automatically shut up after running 8 hours under sleep mode.

Timer on start-up and sleep mode are implemented at the same time, and the sleep mode can not be functioned.

7. Timing fuction

The timing scale is between 1h to 12h, the displayed time is shown by 1 hour as the unit.

8. Emergency switch (ON/OFF)

1) When stand-by, to operate by pressing the emergency switch as follows:

To Press the emergency switch in three seconds, the buzzer rings once, and to release, the machine runs into cooling mode; if to holding on, the buzzer rings twice, then the machine runs into heating mode, while when the machine is on, to press the emergency Switch, the buzzer rings once and then the machine shut down.

2) The machine is running mandatorily as the selected mode within 30min after emergency operation, indoor fan motor is running in high-speed, and vane board is swinging. The machine runs into automatic mode 30min later, the selected mode unchanged, the set temperature is 23°C , the rotate speed of indoor fan motor is automatic, and vane board is swinging too.

3) To press the emergency button when the machine operating, then the machine runs into stand-by state.

4) Under emergency operation, the Compressor's time-lapse protection, anti-frosting protection in cooling, Overheating protection in heating and sensor fault protection and defrost operate are effective.

5) Under emergency operation, once effective signal from remote controller is received, then the machine exits form the emergency mode, and operate according to the setting from remote controller.

9. Auto-restart function

1) The PCB retains the setting parameters in case of power off. When the power supply is resumed, the machine, which has been started up the power-off memory function, is able to restore into the original running state automatically.

2) To press the emergency button and power on, and hold on 10 seconds, exit from the power-off memory function, buzzer rings four tomes.(default: no this function)

10. Protection/ Troubleshooting functions

1) Compressor's protection function:

- a. The PCB which has Power-off memory function, once this function is started up, the compressor goes along 3min delay protection when power on. If the PCB hasn't been started up this function, even when the PCB is power-on, the compressor doesn't process 3 min delay function.
- b. Compressor's 3 min interval protection: the compressor can't start-up until 3 min later(except for defrosting process).
- c. After the compressor started, the compressor's state isn't subject to the changes on ST,RT in 3min.

2) Anti-frosting protection of indoor evaporator:

If $IPT \leq 0^{\circ}\text{C}$ detected in consecutive 5 min, compressor and outdoor motor stoped, indoor fan motor runs at high-speed forcibly; $IPT \geq 5^{\circ}\text{C}$ detected 3min later, then outdoor fan is activated. And the compressor, indoor fan motor restores the original state.

3) Overheating protection:

$IPT \geq 55^{\circ}\text{C}$, the outdoor fan stops, $IPT \geq 65^{\circ}\text{C}$, the compressor stops, indoor fan motor runs at high-speed forcibly. When $IPT \leq 48^{\circ}\text{C}$, outdoor fan motor and the compressor open, indoor fan motor restores the original state.

4) Anti-cold wind control in heating:

- a. When runing into the heating mode, once the compressor fails to comply with the start-up conditions, the wind speed is regulated according to the coil temperature in 2 min(including stopping the indoor fan motor), 2 min later the indoor fan motor stops.If the compressor starts up within 2 min, then operating by Figure 5.

Under heating process, to close the compressor (including the downtime protection), the wind speed is regulated according to the coil temperature in 1min(including stopping the indoor fan), 1min later the fan is stoped forcibly.

- b. When the indoor fan motor running at a low-speed wind and in anti-cold wind operation, once electric heating opens, the vane immediately withdraws from the anti-cold windy location and turn back to normal vane angle. When electric heating closes, indoor fan motor go on to run at low-speed wind, accordingly, the vane turns to anti-cold windy location.

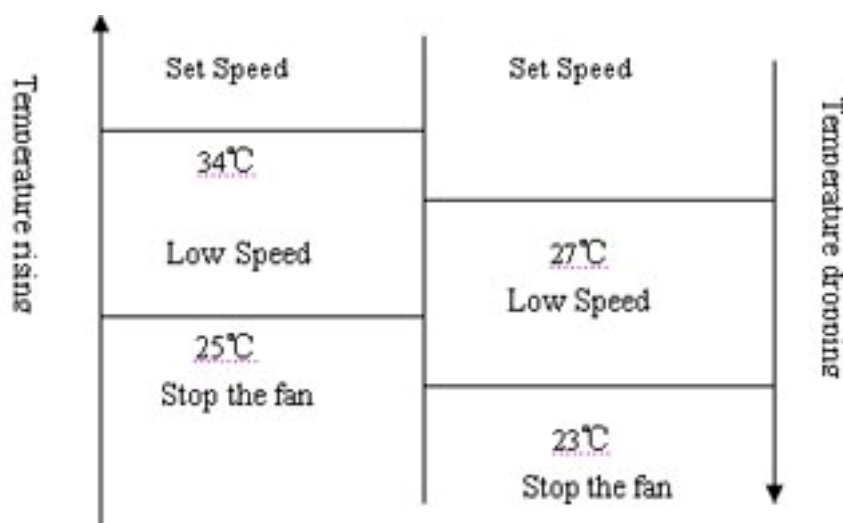


Figure 5 Anti-cold Wind

- 2) The following table shows the fault protections. When failures happens, the PCB alarms and buzzer rings three times. Failure code appears, and the PCB operates protection procedures.

Failure code: For the machine has LED, the code displays on LED, for no LED machine, the code reflects by the running light.

Failure	Running Light Flash	LED Display
RT Sensor Failure	Once / Period	E1
IPT Sensor Failure	Twice / Period	E2
Indoor Fan Motor Failure	6 times / Period	E6

When there is LED displaying failure code, the code is displayed statically, if there are several failure codes should be reported at the same time, then failure codes appears one by one every eight seconds correspondingly.

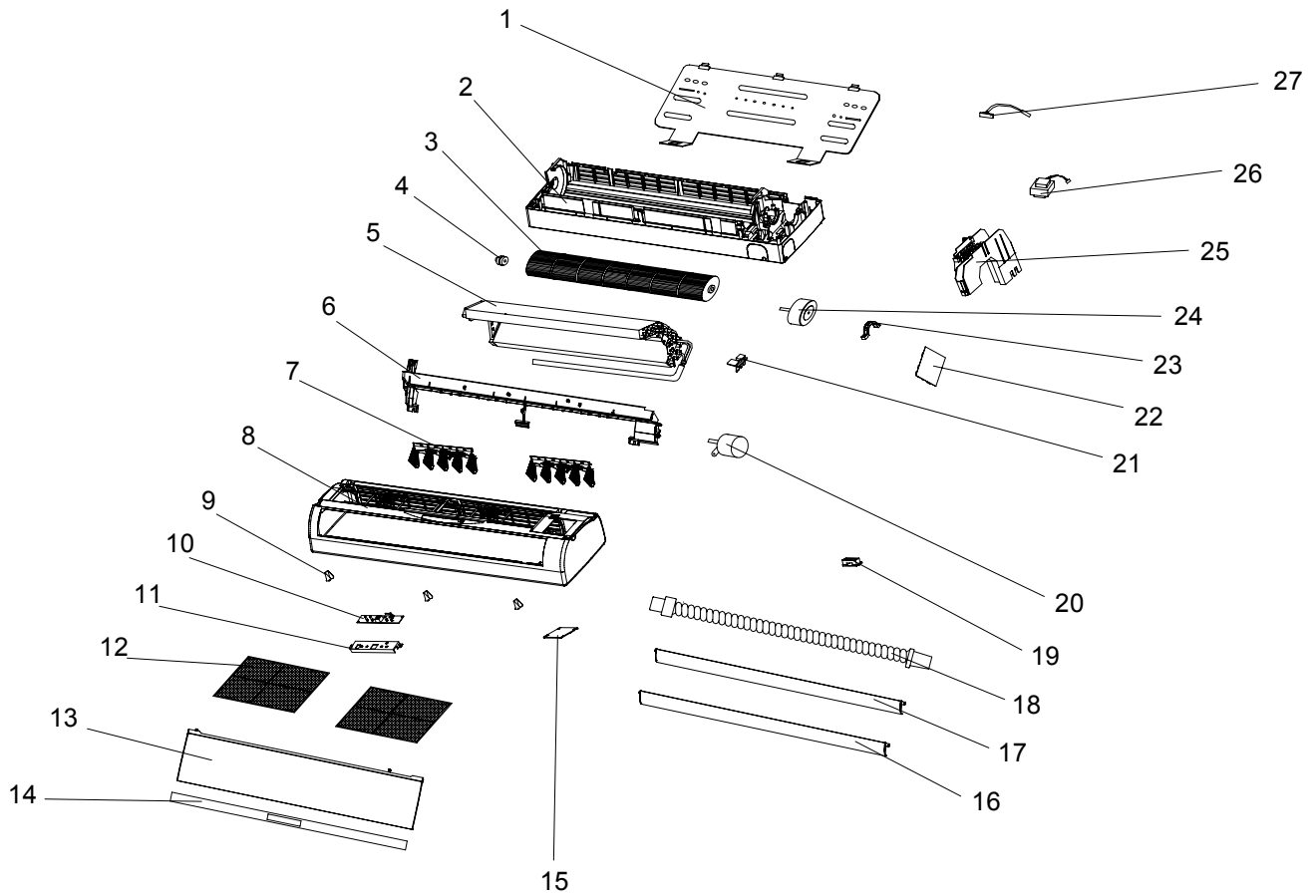
a. Sensor's failure protection: when the sensor's temperature is out of the range $-50 \leq T \leq 110$ °C, then sensor failure is determined. Once RT, IPT sensor failures appear, the compressor stops and indoor and outdoor fan motors shut off. Remote controller doesn't response to any signal except for shutdown. During failure the machine can run in fan mode. After the failure is settled, the PCB restores to standby status.

b. Failure protection of Indoor PG fan motor: If there is no feedback signal of rotate speed within 5, the indoor fan motor stops, at the same time, the compressor, outdoor fan motor, four-way valve and auxiliary electric heater etc cut down. 10 seconds later, the indoor fan motor restarts, once there is no feedback signal of rotate speed within 5 seconds either, then the machine stops and goes into indoor fan motor failure protection, buzzer rings three times, and running light flashes at 6 times per 8 seconds. When the failure is confirmed, once there is feedback signal, the failure is relieved automatic.

EXPLOSION VIEW

Mode: SSH-I304BE

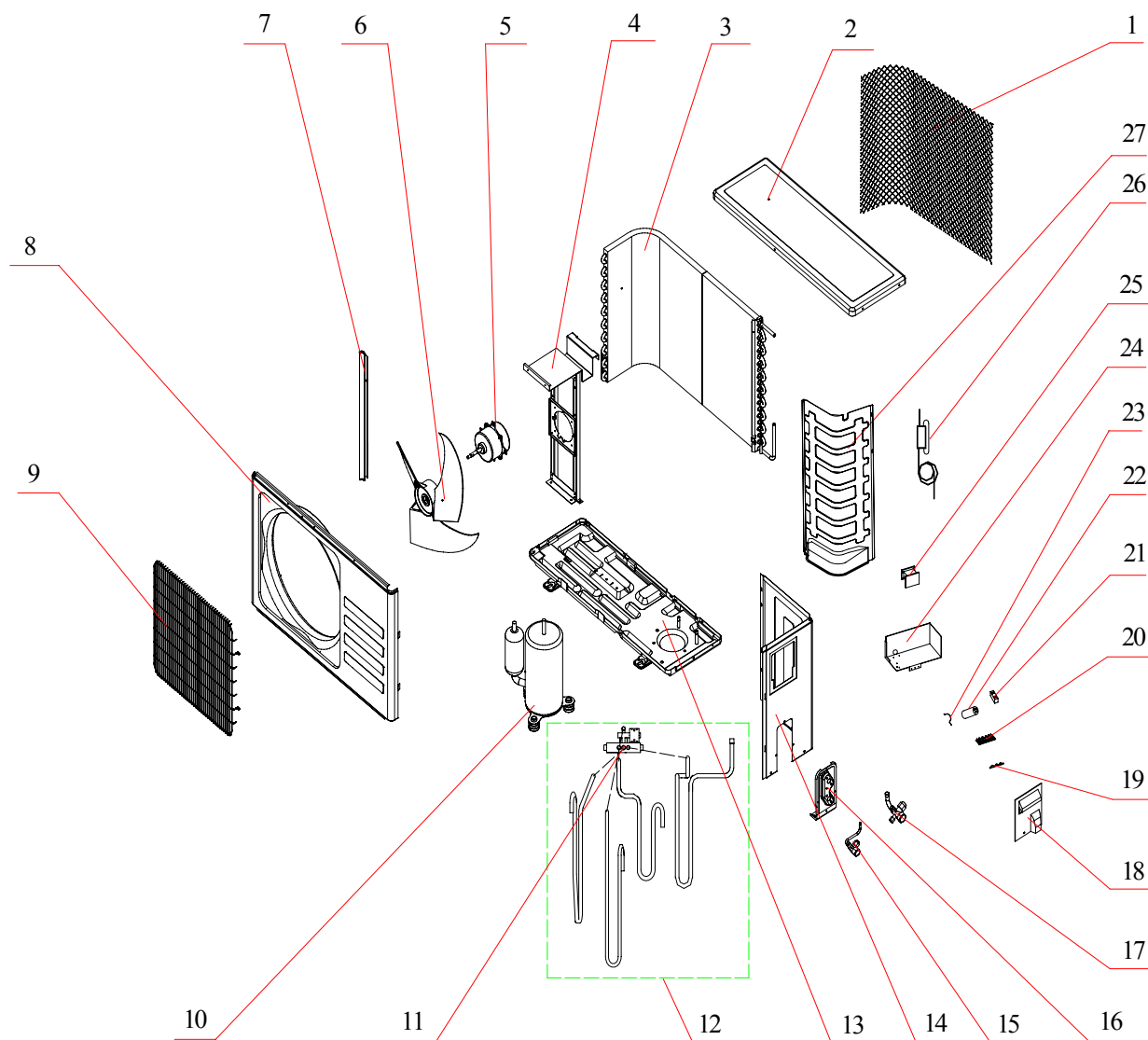
INDOOR UNIT:



EXPLOSION VIEW

MODEL: SRH-I304BE

OUTDOOR UNIT:



Indoor Unit- SSH-I304BE

No.	Part No.	Part Name	Q'ty	Remark
1	1080030001	Installation Plate	1	
2	1070701047	Base	1	
3	1070020014AA	Cross Fan	1	
4	1070100010	Bearing Mount	1	
5	1110050321	Evaporator	1	
6	1070701048	Water Drainage Assembly	1	
7	1070701050	Vertical Vane Assembly A	1	
	1070701051	Vertical Vane Assembly B	1	
8	1070701069	Face Frame	1	
9	1070701062	Screw Cover	3	
10	1090500501	Display PCB	1	
11	1073090126	Display PCB Box	1	
12	1070190058	Left Air Filter	1	
	1070190059	Right Air Filter	1	
13	1070500698	Front Panel	1	
14	1071990077	Display PCB Cover	1	
15	1073090114	Electrical Box Cover	1	
16	1070701052	Vane A	1	
17	1070701053	Vane B	1	
18	1070110011	Drainage Hose	1	
19	1070040003	Cable Clamp	1	
20	1170020041	Vane Motor	2	
21	1073030201	Sensor Holder	1	
22	1090700403	Main PCB	1	
23	1073090120	Indoor Motor Cover	1	
24	1170030048	Indoor Motor	1	
25	1070701450	Electrical Box	1	
26	1173090107	Transformer	1	
27	1170230001	Indoor Sensor Assembly	1	
28	1090050298BU	Remote Controller	1	Not shown in Explosion view
29	1070060003	Remote Controller Supporter	1	
30	1190060003SA	Indoor Carton	1	
31	1190060070	Left Foaming	1	
32	1190060069	Right Foaming	1	
33	1190060002	Middle Pasteboard Supporter	1	
34	1190060021	Middle Foaming Supporter	1	

Outdoor Unit- SRH-I304BE

No.	Part No.	Part Name	Q'ty	Remark
1	1071990041	Grille	1	Optional
2	1081990038	Top Cover	1	
3	1110061755	Condenser	1	
4	1081990042	Outdoor Motor Supporter	1	
5	1170040102	Outdoor Motor	1	
6	1170120146AA	Propeller Fan	1	
7	1081990040	Left Grille Supporter	1	
8	1081990047	Front Plate	1	
9	1071990045	Fan Guad	1	
10	1100011034	Compressor And It Accessories	1	
11	1120110017	4-way Valve	1	
12	1120640340	4-way Valve Assembly	1	
13	1081990178	Base	1	
14	1081990039	Right Plate	1	
15	1120120024	Two-way Valve	1	
16	1081990041	Valve Supporter	1	
17	1120130037	Three-way Valve	1	
18	1070350971	Electrical Box Cover	1	
19	1074060118	Cable Clamp	1	
20	1170200054	Terminal	1	
21	1170100030	Fan Motor Capacitor	1	
22	1170100025	Compressor Capacitor	1	
23	1080010006	Capacitor Strip	1	
24	1081990049	Electrical Parts Box	1	
25	1174561801	AC Contactor	1	
26	1120640341	Capillary Assembly	1	
27	1081990050	Partition plate	1	
28	1174561802	Outdoor Sensor	1	Not show in the explosion
29	1190500707PW	Cabinet Carton	1	
30	211310615	Upper Foaming	1	
31	211310616	Base Foaming	1	
32	1190060191	Base Carton	1	

ANNEX 1 TROUBLE SHOOTING

INDEX

- 1. Electric parts**
- 2. Refrigerant system**
- 3. Troubleshooting**
- 4. Installation Fundamentals**

1. Electric parts

It is compressor and motor fan that finally drives after power is supplied. And it is necessary to check the internal factors like switches, protectors, or lead wires that are needed to reach the compressor and motor fan to see if their connections are normal and the external factors to see if voltage is normally supplied.

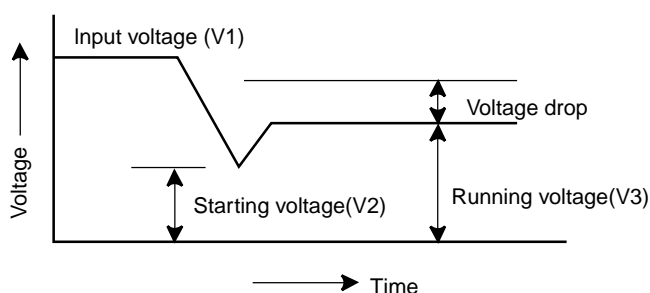
1.1 External factors check

1) Working power and voltage drop

The rated voltage for airconditioner is specified in a workable range.

In order to operate airconditioner normally, it is desirable for the working voltage and minimum. starting voltage to be within the following chart range.

Especially, just the fact that the voltage when airconditioner is not at work is within the working voltage range is insufficient, and the voltage is sure to be within the working voltage range by measuring in a operating condition.



* Usable voltage = Product rating $\pm 10\%$

2) Electric wire capacity

The electric wire for airconditioner should have an allowable current more than the load current of the circuit and be able to control the voltage drop by the load current within 2%.

And it should be a thickness capable of keeping the voltage drop by a starting current within -10%, and especially for an airconditioner of single phase, the voltage drop (Flicker voltage) by the starting current be within about 5%.

A = $V1 - V2$: Voltage drop by the starting current of airconditioner (Flicker voltage)

B = $V1 - V3$: Voltage drop by the normal running current of airconditioner

$$\frac{V1 - V3}{V1} \times 100 \leq 2\% \text{ (B case)}$$

$$\frac{V1 - V2}{V1} \times 100 \leq 5\% \text{ (A case)}$$

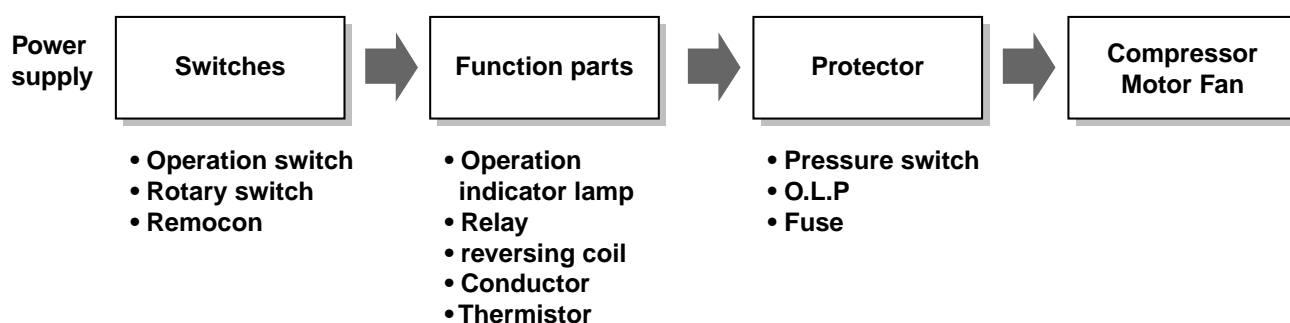
In case of using an airconditioner in a low voltage area where power supply voltage is low, especially, the Flicker voltage due to inadequate wires may cause the fluorescent light to be off or may affect the other electric products. So, care should be taken to the wiring work.

3) Wire thickness required

Rated current appliance(A)	Nominal cross-sectional area(mm ²)
Up to and including 6	0.75
Over 6 up to and including 10	1.0
Over 10 up to and including 16	1.5
Over 16 up to and including 25	2.5
Over 25 up to and including 32	4.0
Over 32 up to and including 40	6.0
Over 40 up to and including 63	10.0

For rated currents up to 3A, a nominal cross-sectional area of 0.5mm² is only allowed if the length of the cord does not exceed 2m.

1.2 Internal factors check



1.2.1 Insulation resistance

Measure the insulation resistance between live part and dead metal part by 500V insulation resistor to check if the insulation resistance is more than 10MΩ.

1.2.2 Insulation resistance measurement of compressor

Measure the insulation resistance of compressor between compressor terminal and dead metal part by insulation resistor, and the insulation resistance should be above 10MΩ.

Compressor may change the insulation resistance while running. Accordingly, measure the insulation resistance just after running as needed.

- **Note:** For R-22 used in airconditioner, the dielectric rate on liquid state is high. If a contaminant is mixed into R-22, the electric resistance is extremely low and the poor insulation is occurred. Accordingly, be sure to prevent contaminants from mixing into refrigerant system.

1.2.3 Running capacitor

1) Earth inspection between terminal and body

As shown in Figure 1, connect a resistor between one side terminal and body of condenser to check for continuity.

2) Capacity inspection

(1) Remove the lead wire from both terminals of condenser to be checked.

(2) Contact both terminals of lead wire for 2-3 sec., and discharge.

(Be sure to perform to prevent the tester damage before measuring.)

(3) After discharging, contact both terminals of tester with the terminal of condenser to see the dial vibrating direction of resistor. (See Figure 2.)

There are three kinds of dial vibrating direction in tester, and each vibrating direction and symptom is as follows.

A: Normal : Dial shakes instantaneously and returns to the original state immediately.

B: Short : Dial remains moved.

C: Capacity consumed up : Dial does not move at all.

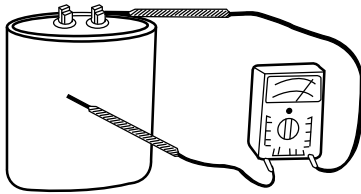


Figure 1.

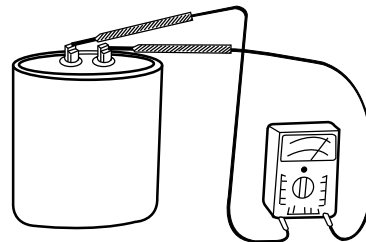


Figure 2.

1.2.4 Motor fan

1) Power off, remove motor fan, and test independently.

2) Measure the resistance of main coil, sub coil and control coil in motor.

3) Use a good quality of capacitor in testing.

4) Diagnose the following troubles by the independent test, and replace motor.

a) Motor is not started.

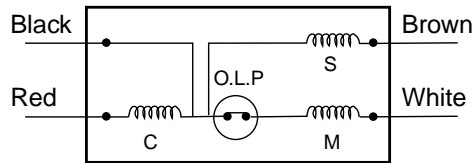
b) Motor rotation rises very slowly.

c) Bearing failure : The shaft does not move.

d) Arc occurs in the motor inside.

e) Smoke emits from motor inside.

f) Excessive noise



Measuring main coil resistance : White ↔ Black

Measuring sub coil resistance : Brown ↔ Black

Measuring control coil resistance : Red ↔ Black

1.2.5 Thermostat

There are 3 kinds of thermostat malfunction.

- 1) Leak of gas charged in sensor part
- 2) Short of contact point
- 3) Wrong wiring

Switch off at room temperature 18-30°C, turn carefully the knob of thermostat from 1 to 10 (the number may be different or a figure be used according to model) or reversely, and click sounds.

After the sound is heard, turn reversely to check again the click sounds.

If click sounds, the thermostat is in normal. If room temperature exceeds 30°C, test should be done after cooling by putting the sensor part of thermostat into a cold water container because the contact point is not opened.

If knob is turned but click does not sound, remove the thermostat cover and examine the contact point.

The fused contact point should be replaced with a new thermostat.

If contact point is not closed despite of the sensor temperature being sufficiently high, the gas at the sensor part may be leaked. In this case, replace the thermostat.

When replacing thermostat, be sure to conduct after performing carefully as the above content.

1.2.6 Thermistor

Pull out the lead wire of thermistor terminal to test continuity.

Connect a tester to the terminal of thermistor and measure the resistance. The resistance value varies according to the measuring condition and temperature, so in order to vary temperature forcibly, put water in a cup, cool the sensor part of thermistor, and then measure the resistance, and also measure in a condition that the sensor part of thermistor becomes warm by hands.

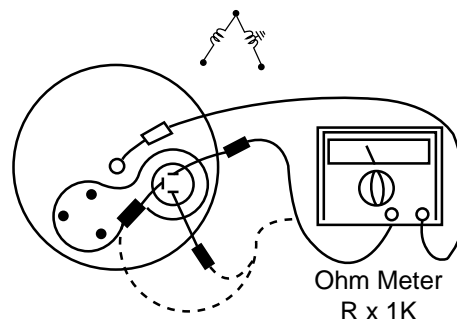
1.3 Compressor trouble diagnosis

1.3.1 Electrical troubles

1) Ground test

Test single phase and three phase in the same manner.

- (1) Shut off the power supply to product.
- (2) Remove the wires connected to the compressor terminal.
- (3) Clean the compressor terminal and discharge (suction) pipe.
- (4) Measure the resistance of discharge (suction) pipe and each terminal by using a R x 1K scale of Ohm meter.
- (5) If dial moves remarkably, the terminal is in ground state. So, replace the compressor.



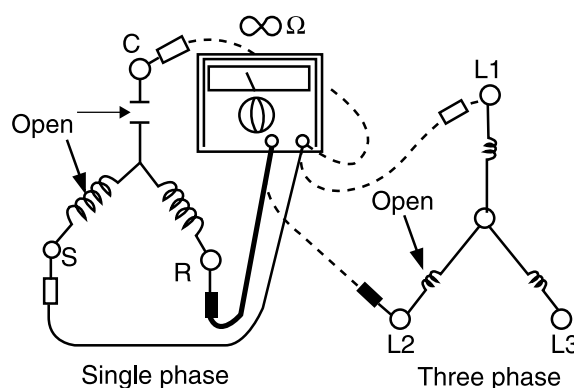
2) Wrong wiring check of compressor terminal

Examine the wiring diagram of compressor terminal or the electric circuit diagram of product on the cover of compressor terminal to check if there is wrong wiring.

3) Checking of wire disconnection or overload protector (O.L.P) operating condition

This check is to see the wire terminal condition of motor inside, and for a single phase compressor with O.L.P built-in, it identifies the O.L.P operating condition and wire disconnection.

- (1) Shut off the power supply to product.
- (2) Remove the wires connected to the compressor terminal.
- (3) After checking the ground state, cool the compressor sufficiently.
(at room temperature)
<For single-phase compressor>
- (4) Measure the resistance of each terminal by Ohm meter R x 1K scale, and if dial does not move, compressor is in opened condition.
<For three-phase compressor>
- (5) Measure the resistance of each terminal by Ohm meter R x 1K scale, and if dial does not move, the wire between two terminals is disconnected.
-> Action: Replace the compressor.



* OLP may be operated by the following causes, so be sure to find and remove the cause.

- (1) Operation at low voltage
- (2) Defects of operation or starting device
- (3) Overheat of compressor motor due to the condensing coil closing, condensing motor defects, liquid line close, or injection capillary close.

1.3.2 Mechanical troubles

1) Not starting

- (1) Phenomenon : Compressor is not started but the starting current continues to flow.
- (2) Checking
 - a) Check capacitor. (for a type where a capacitor for compressor starting or operating is used)
 - b) If there is no trouble, it is judged as lock due to the wear of compressor inside or the damage of lubricating device. Replace the compressor.

2) Poor compression

- (1) Phenomenon : Compressor is at work, but the cooling capacity is weak, the pressure of high pressure side is low and the pressure of low pressure side is high.
- (2) Cause : Damage of valve in compressor inside, damage of connecting rod or crank shaft, or other internal leak
- (3) Checking
 - a) Stop and then start the condenser fan, and if the pressure of high pressure side does not increase, the compressor is bad.
 - b) Measure the temperature of discharge pipe in compressor, and if it is abnormally low temperature (50°C or less), the compressor is bad.
 - c) Conduct the pump down test of system to check the compression capacity.
 - Power off the product.
 - Close the service valve of liquid line. (Rotate the valve rod clockwise to close the valve rod.)
 - Start product and observe the suction pressure.
 - If compressor is normal by pumping down the system, pressure is kept 0-5 psiG (0-0.35kg/cm².G), and if the suction pressure increases, the compressor is bad due to the internal leak or valve damage.
- (4) The compressor to be assumed as bad compression should be replaced.

If running for a long time in a bad compression condition, abnormal superheat may occur and the compressor motor is burnt.

 - Clean the cycle.

3) Overcurrent flowing while running

Check the working pressure, and if there is no trouble, it is assumed as the compressor bearing damage. Replace the compressor.

(Excessive refrigerant charging may cause the overcurrent.)

2. Refrigerant system

2.1 Refrigerant system troubleshooting

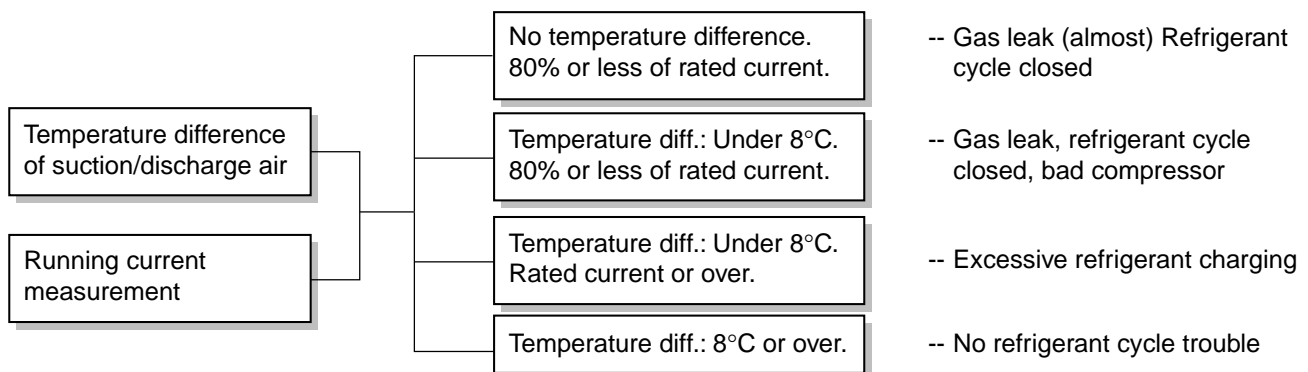
Check the following items when troubleshooting the refrigerant system.

- 1) The thermostat setting or remocon temperature setting is not wrong?
- 2) Air filter is not cleaned?
- 3) Blower fan control switch is not at "low"?
- 4) Ventilation lever is not opened?
- 5) There is no obstacle in suction or discharge side of outdoor unit?
- 6) Dirty heat exchanger causes the heat exchanging efficiency to be down?
(Thorough cleaning)
- 7) Cooling/heating load is not increased?
- 8) Too many persons are in room? (Cooling)
- 9) The insulation of window gap is not wrong?

If there is no trouble from the above checks and also if there is no trouble on the electric appliances of airconditioner body, it is assumed as refrigerant system failure.

- a) Set aircon to High cool, run cooling for 15 min. or more, and measure the temperature difference of suction/discharge air in indoor unit. (Adjust the wind direction so that wind is discharged to the front direction in the installed condition.)
- b) Measure the voltage and current in running condition.
- c) Measure the pressure of low pressure side in cooling condition.
(If the temperature is low, convert into the test switch.)

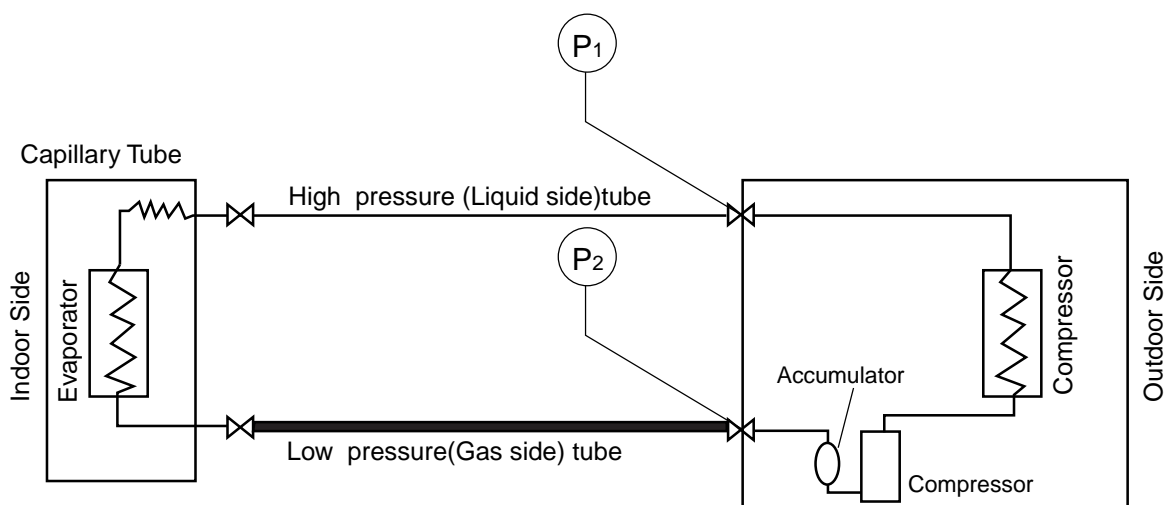
2.1.1 Temperature difference and current of suction/discharge air in evaporator



• Temperature difference of suction-discharge air

Normally, the temperature difference is based at 10°C. Actually, the judgement criteria is 8°C, because when the room humidity is high, the temperature difference is small and when humidity is low, it becomes large.

2.1.2 Pressure and temperature of refrigerant



The pressure in normal condition shows the figure in the right side table, but the pressure (P1) of high pressure side tube is affected greatly by the temperature change and about 16kg/cm².G in a low temperature condition (indoor/outdoor 21°C).

The pressure fluctuation is affected by the tube length or insulation as well as temperature change, so measure the pressure (P₂) of low pressure side for the trouble shooting of refrigerant system.

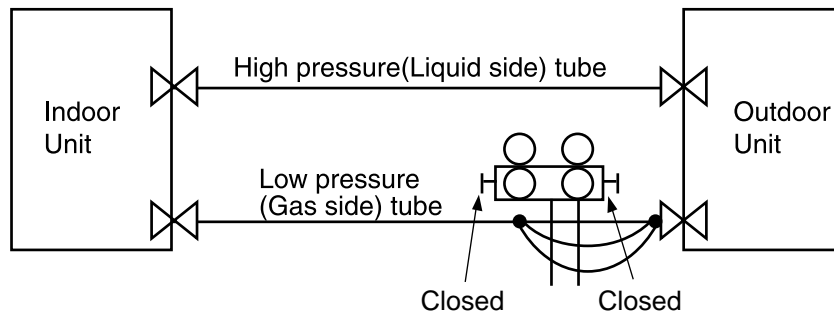
Measuring place	Pressure(kg/cm ² G)
P1	About 19.5
P2	About 5.0

<Trouble finding by pressure/temperature>

Pressure (than normal)	Temperature (than normal)	Cause	Explanation
Higher	Higher	Bad compression: Compressor failure, Bad reversing Valve	Current flows weakly.
	Normal	Cooling load is small.	Current flows weakly.
		Liquid refrigerant suction: Excessive refrigerant charging	High pressure is not increased rapidly in early running stage.
Lower	Higher	Gas short : Gas leak	Current is low.
		Closed : Pipe internal	Current is low.

Note) The high/low temperature is a figure converted into pressure.
The low pressure is normally 4.5-6.0kg/cm².G.
(Temperature is normally 3°C-10°C.)

• Pressure measurement of low pressure side



As shown in Figure above, connect the manifold gauge to the low pressure (gas side) tube of condenser and measure the pressure.

2.1.3 Symptoms and actions

1) Short of refrigerant

The short of refrigerant appears in a slightly different symptom as (1) no refrigerant or (2) short of refrigerant.

(1) Symptoms : The temperature difference of suction-discharge air is 8°C or less, the running current is less than the rated current, and the pressure of low pressure side is low. (These are symptoms changed by short of refrigerant.)

(2) Judgement method : Frost is formed from the capillary tube outlet to the evaporator inlet.
The suction pipe of compressor is not cold. (The temperature of suction pipe is similar to the outdoor temperature.)
The pressure of low pressure side in cooling is 4kg/cm².G or less. (Surrounding temperature : 30°C or over)
Refrigerant oil comes out from the evaporator-condenser connections and each welded portion. (Finding the gas leak place)

(3) Actions:

- ① Find the gas leak area. (Check at balance pressure of 5kg/cm².G or over.)
- ② Charge refrigerant to the specified level.
- ③ Check for gas leak.

2) Closing of refrigerant system

(1) Symptoms : If the refrigerant system of strainer or capillary tube is closed, pressure drops at the outlet of closed area, and refrigerant evaporates to form and attach dew or frost.
The running current is less than the rated current, and the pressure of low pressure side is lower than the normal. If completely closed, the pressure of low pressure side is to be 0kg/cm².G as time goes by.

(2) Judgement method : The same symptoms as the short of refrigerant appears, and the same phenomenon occurs even if refrigerant is sealed.
It takes 3 min. or more for refrigerant to balance.
If running in the condition, the temperature of discharge gas becomes higher, the refrigerant oil is deteriorated, and the life time may be affected.
(Compressor motor may be burnt.)

3) Overcharge

(1) Symptoms

- The temperature difference of suction-discharge air is 8°C or less, the running current is higher than the specified current, the pressure of low pressure side is high, and the compressor and suction pipe are cold.
If running in the condition, pressure switch activates at overload operation to make continuous operation impossible, compressor is difficult to start, and fuse or breaker is easy to be disconnected.

(2) Actions

- ① Discharge the refrigerant. (By 3-5kg/cm²G)
- ② Charge refrigerant to the specified level.
- ③ Check for gas leak.

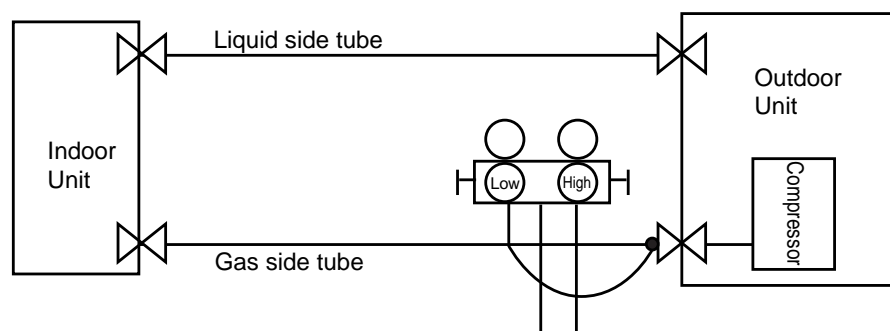
4) Bad compression

(1) Symptoms

- The temperature difference of suction-discharge air is little, the running current is less than the specified current, the pressure of high pressure side is low, and the pressure of low pressure is high.

(2) Judgement method

- Close service valve of high pressure side in condenser (front seat) and connect the manifold gauge to the service valve of low pressure side.
(Close the valve.)
- If the dial of pressure gauge does not indicate 0kg/cm²G or less by cooling in the condition, the compressor is judged as bad.



Note) If pressure gauge is near 0kg/cm²G, immediately stop the cooling.

Otherwise, air flows into the refrigerating cycle or the compressor motor coating is taken off to cause the poor insulation. So, care should be taken.

2.1.4 Summary of check items by cause

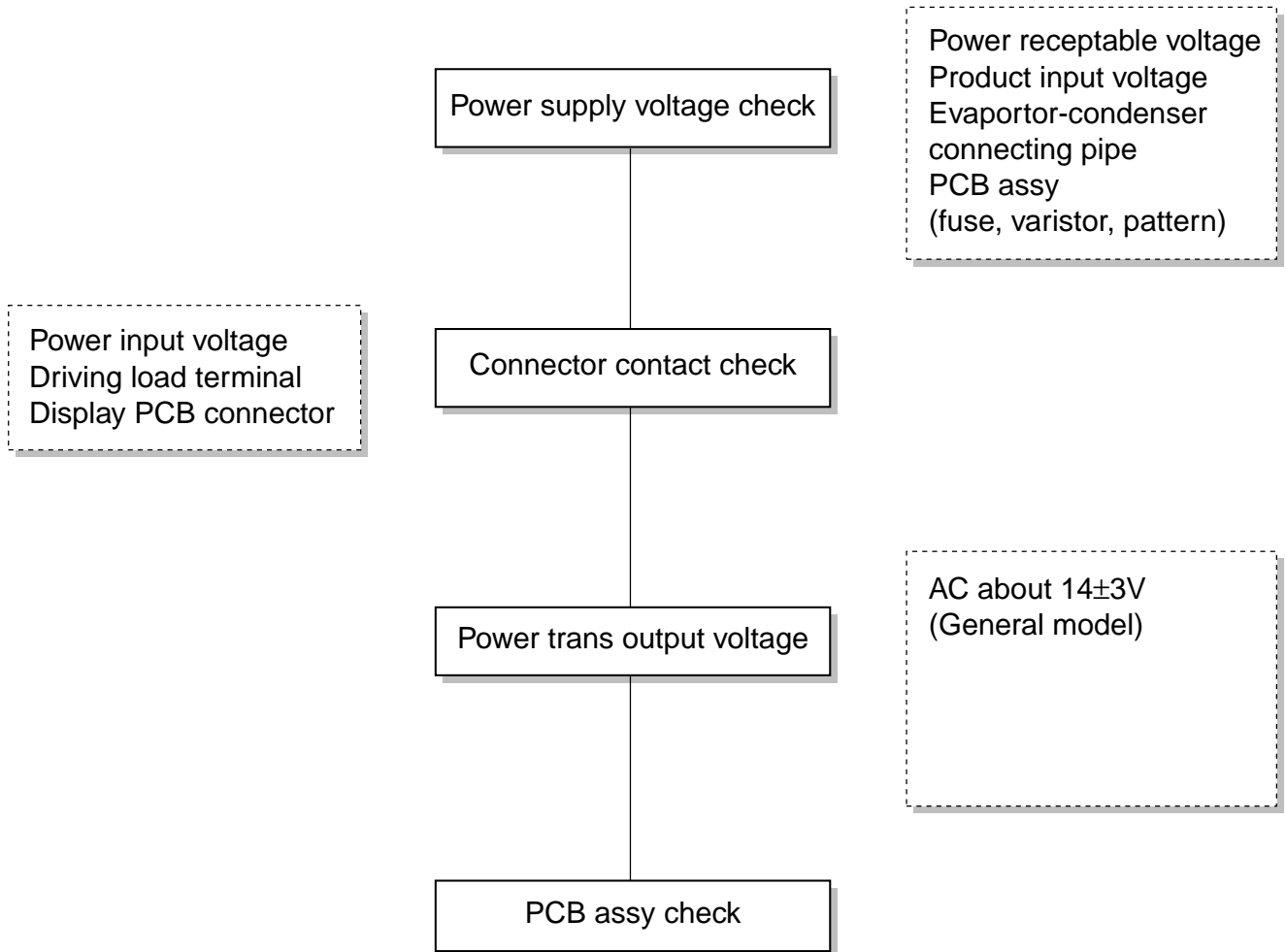
Cause \ Check item	Suction/discharge air temp.diff. of evaporator		Rated current		Low pressure		High pressure	
	Cooling 8°C	Heating 14°C	Cooling	Heating	Cooling	Heating	Cooling	Heating
Short of refrigerant	☺	☺	☺	☺	☺	☺	☺	☺
Capillary closing (a part)	☺	☺	☺	☺	☺	☺	☺	☺
Outdoor heat exchanger contaminated	☺	☺	☺	☺	☺	☺	☺	☺
Indoor heat exchanger contaminated	☺	☺	☺	☺	☺	☺	☺	☺
Bad compressor	☺	☺	☺	☺	☺	☺	☺	☺

2.2 Precautions on repair

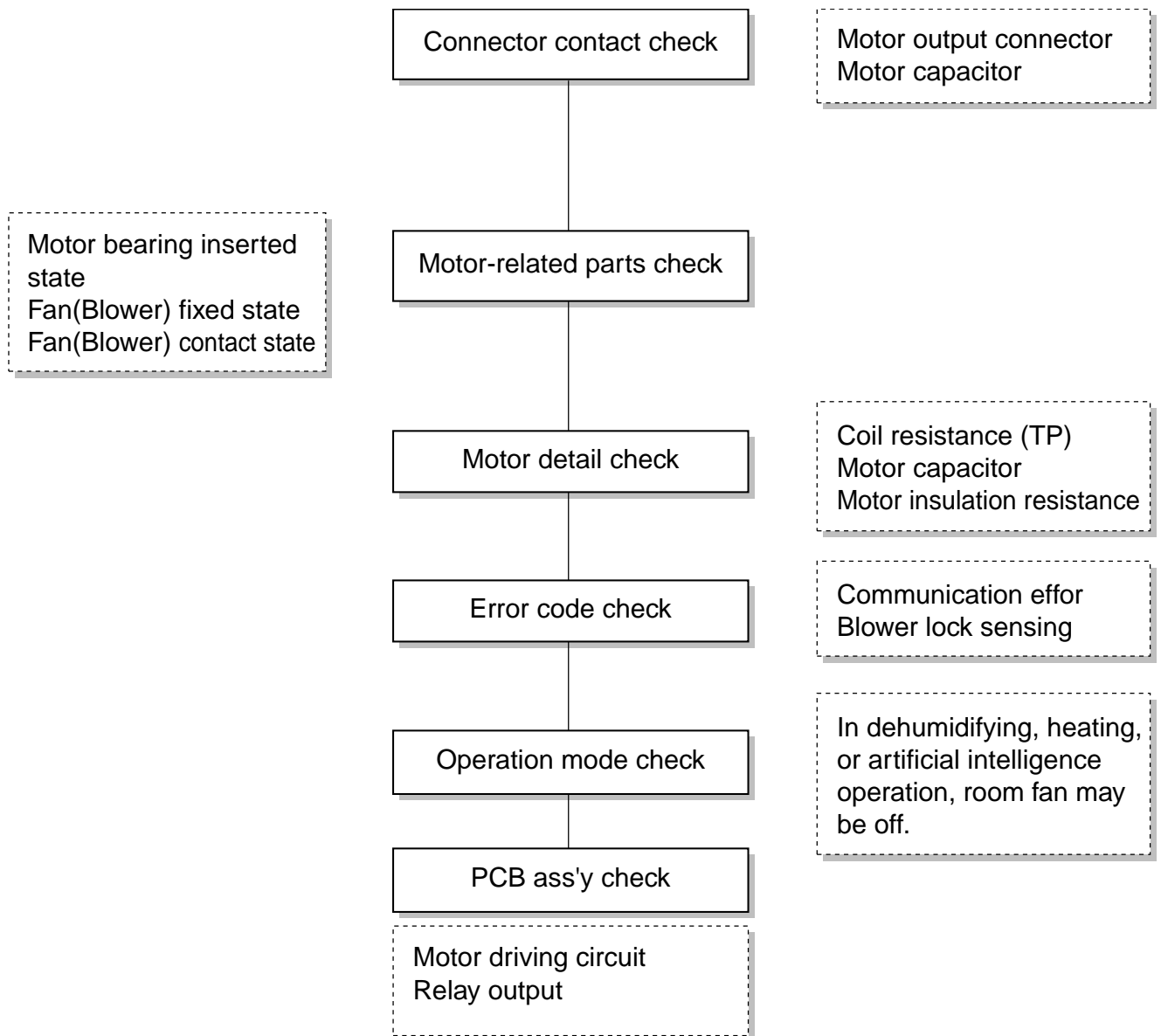
- 1) When discharging refrigerant (from pipe or body), the discharge outlet should direct the direction where nobody exists.
- 2) Do not work near fire or flame.
- 3) Work in a large space if possible and arrange the scaffold.
- 4) Especially for working on rooftop, prepare a place to keep tools and take care to prevent from falling.
- 5) While running (pump down work, test run), do not insert hands into fan.
- 6) Clean the Indoor-outdoor connecting pipes and the manifold gauge edges to be free from dust or moisture.
- 7) Be sure to fill refrigerant to the specified level. (If refrigerant is too much or short, the capacity is down and trouble may occur.)
- 8) Keep tools well, and check the measuring machine periodically.

3. Troubleshooting

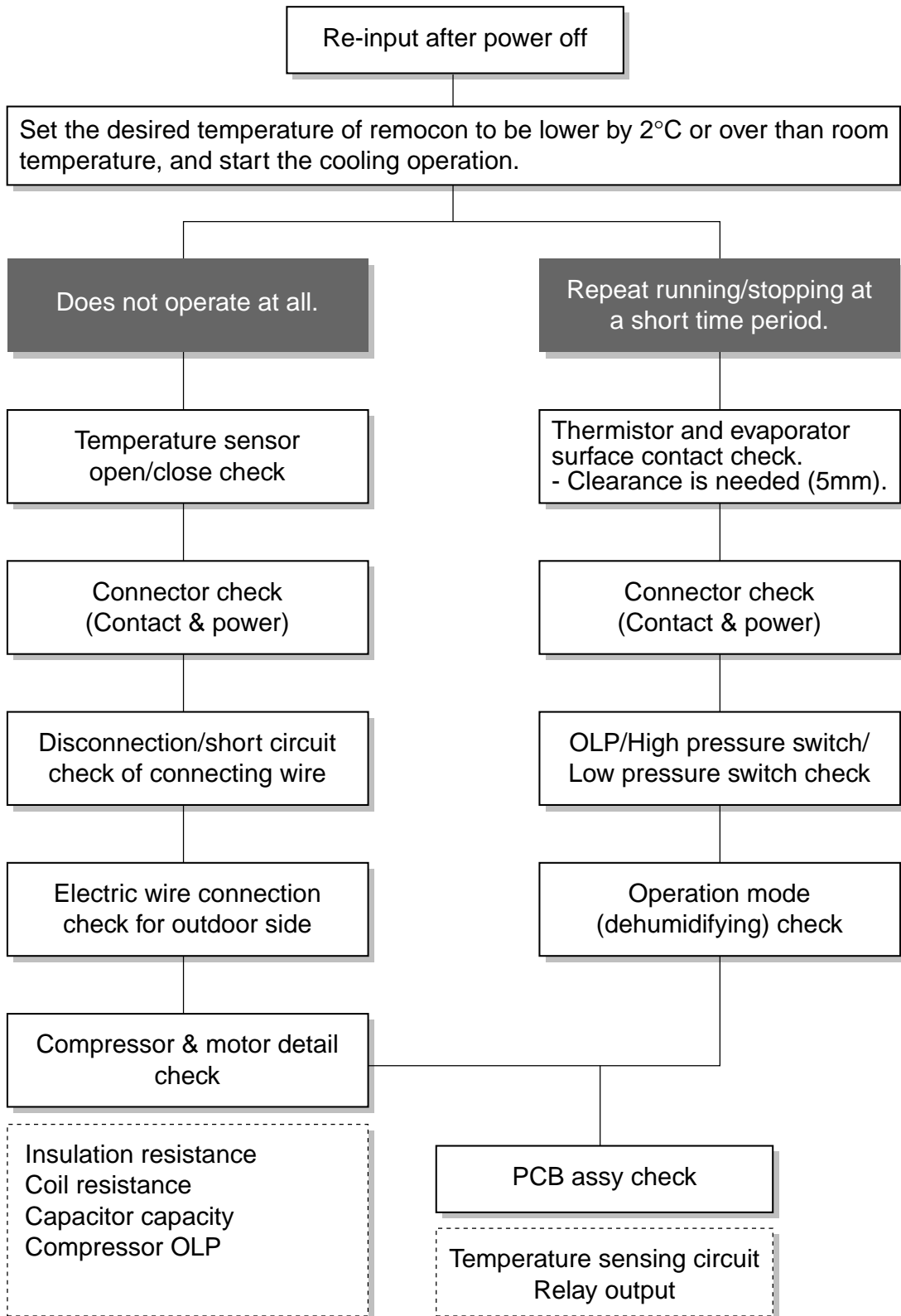
3.1 Product does not operate at all.



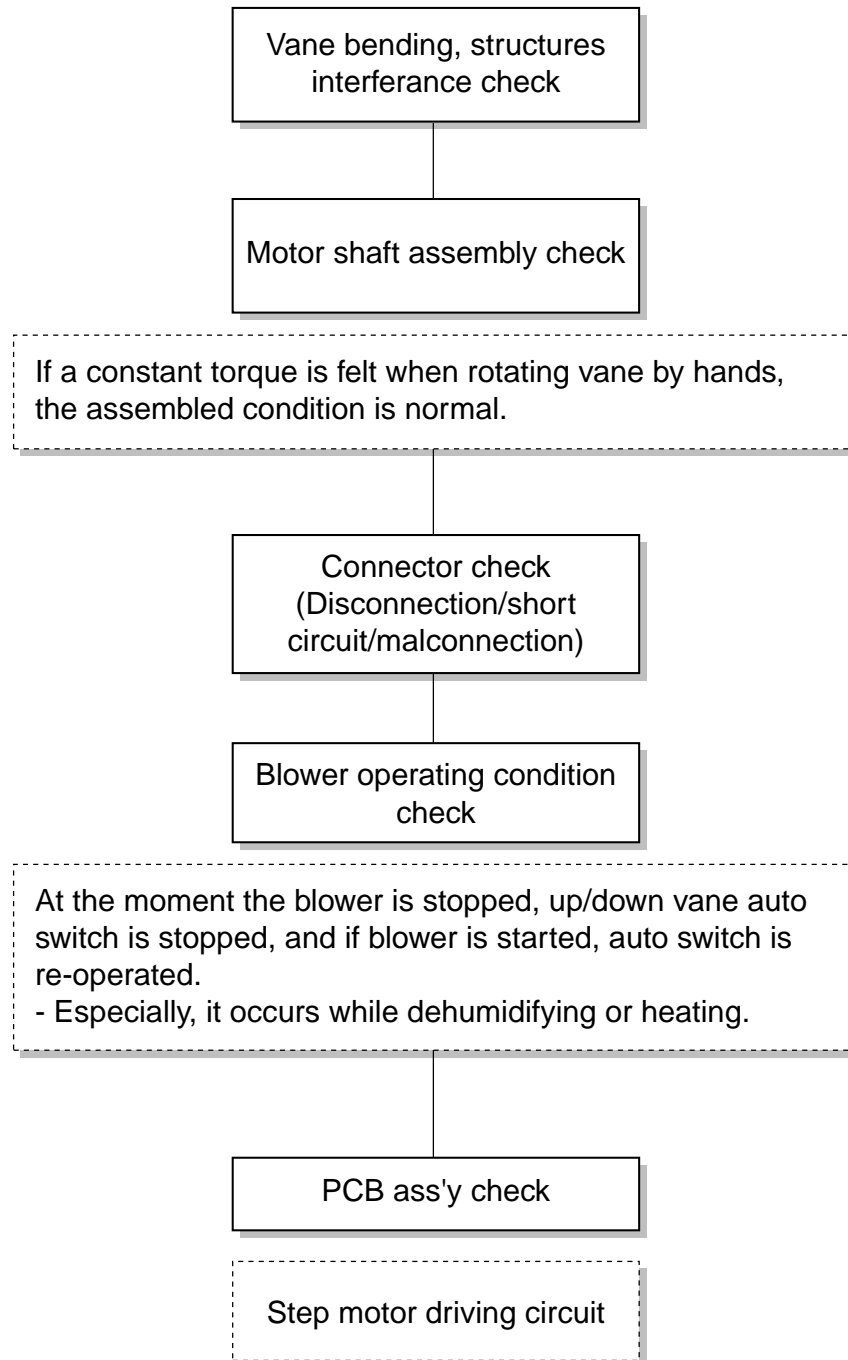
3.2 Room fan does not operate at all.



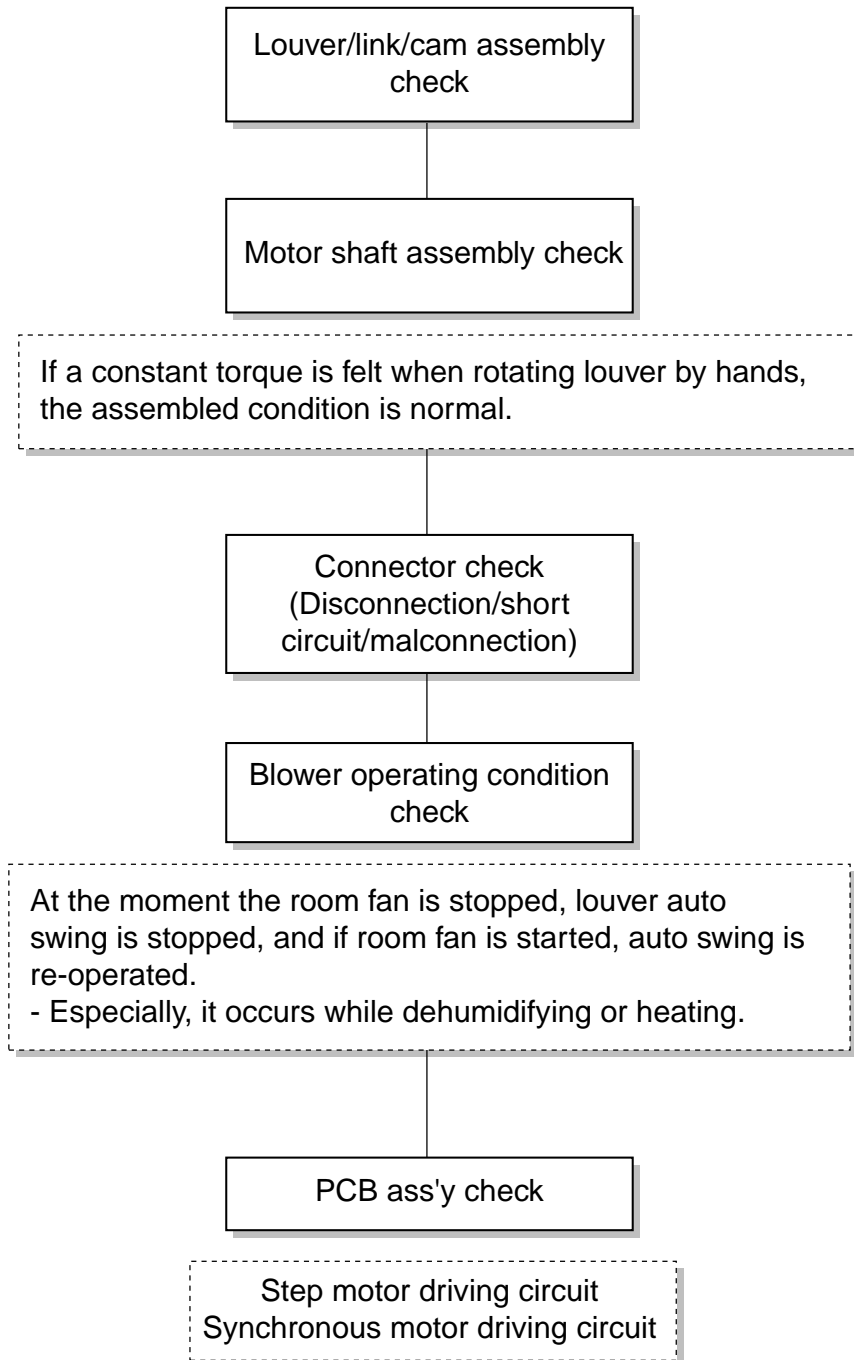
3.3 Compressor or outdoor fan does not operate at all.



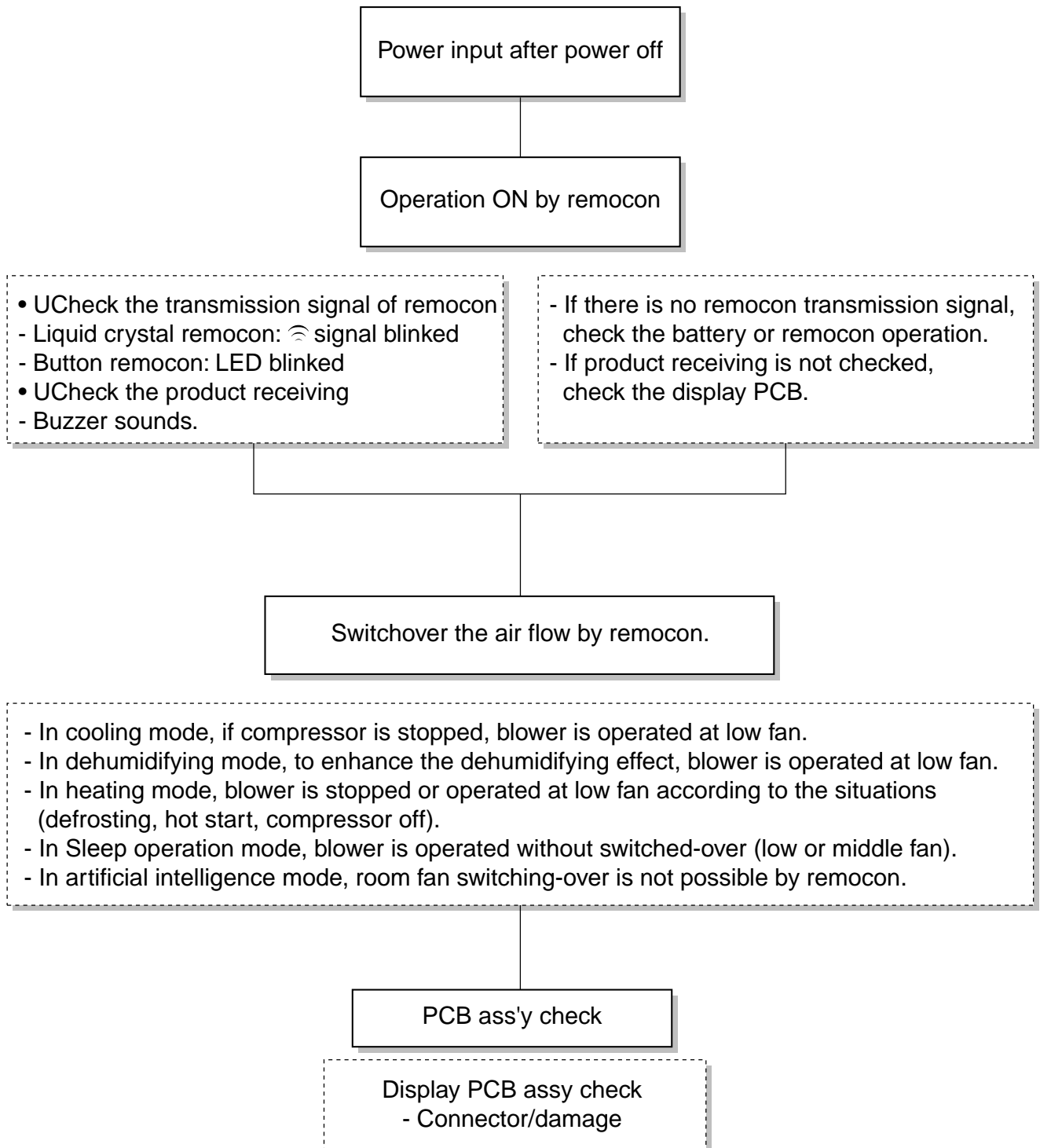
3.4 Up/down vane does not operate at all.



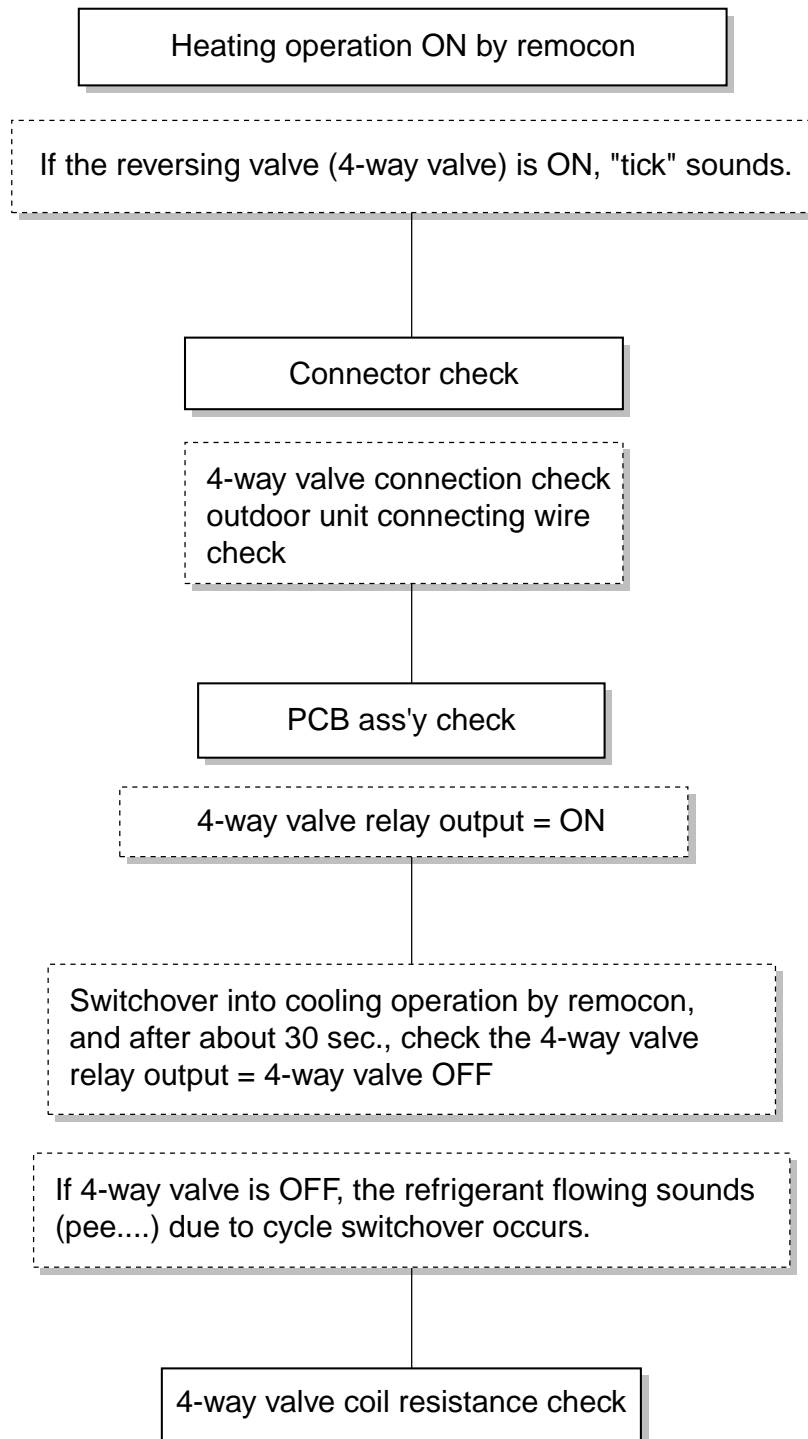
3.5 Left/right louver does not operate at all.



3.6 Function setting by remocon is disable.



3.7 Cooling/heating conversion is disable.



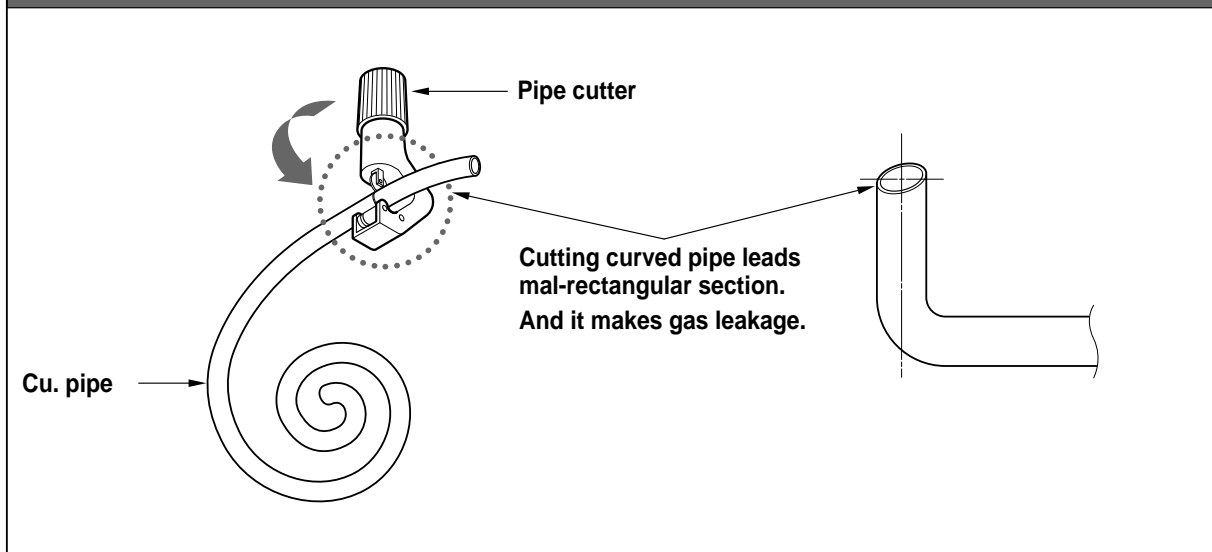
4. Installation Fundamentals

Leakage /Freon - 1/4

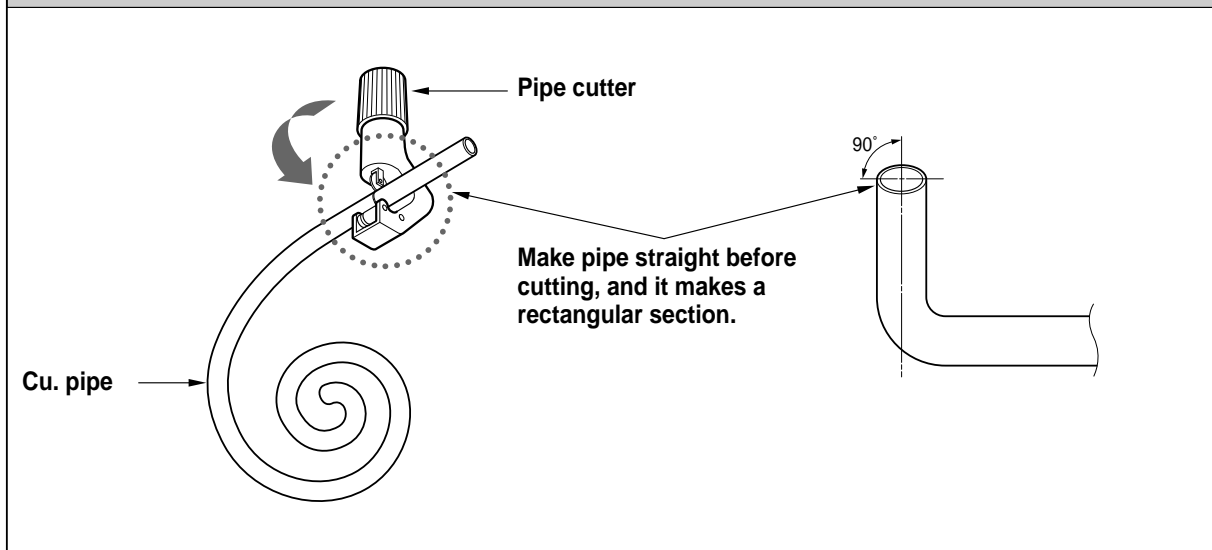
Case-1

Key Factor	Pipe cutting
Troubles & Causes	Gas leaks due to the mal-flared copper pipes with non-rectangular section.

Defect Details

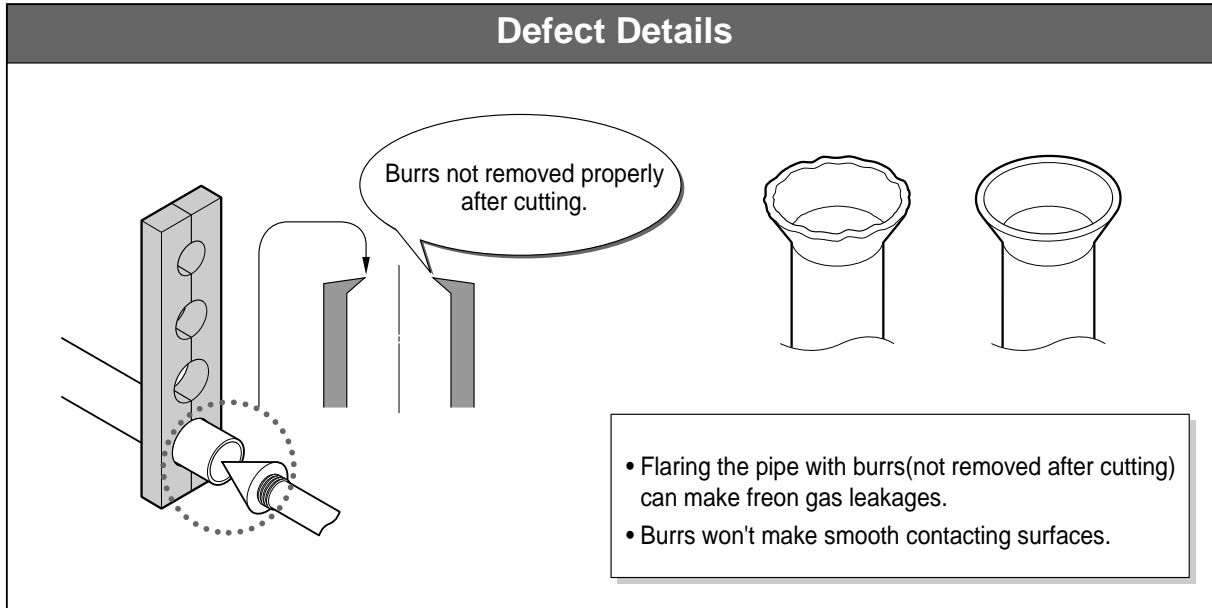
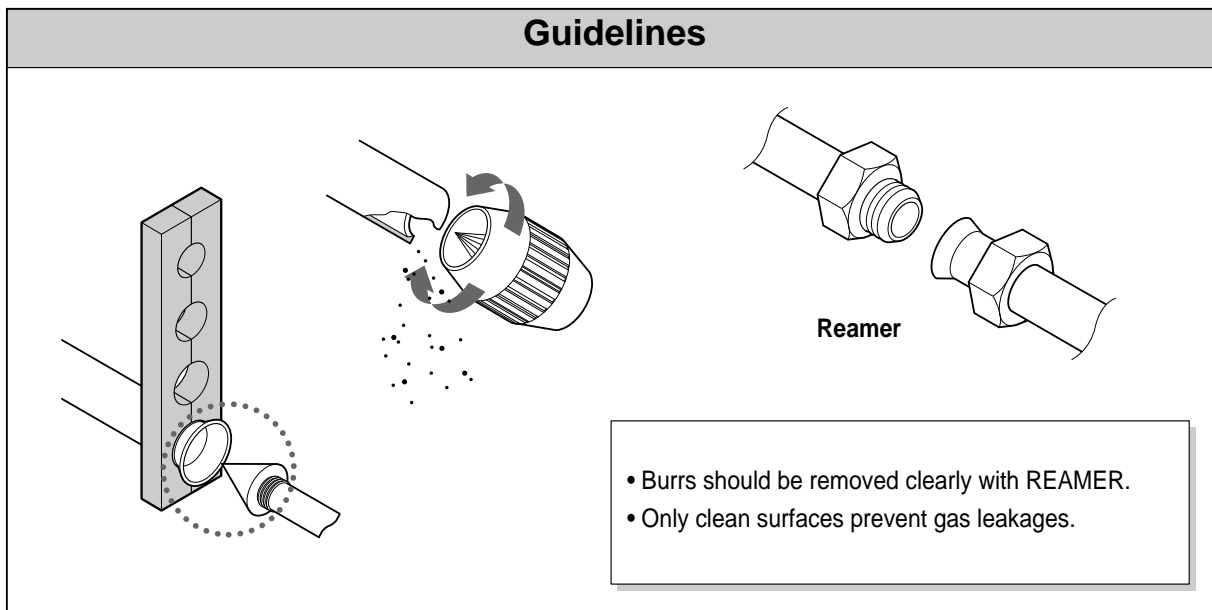


Guidelines



Leakage /Freon - 2/4**Case-2**

Key Factor	Removing burrs of pipes.
Troubles & Causes	Gas Leaks due to the burrs caused by cutting and not removing properly.

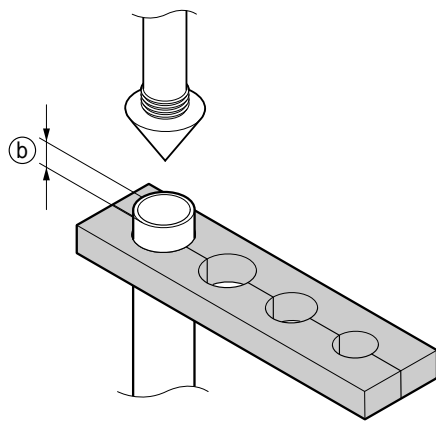
Defect Details**Guidelines**

Leakage /Freon - 3/4

Case-3

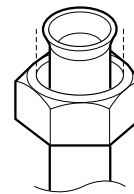
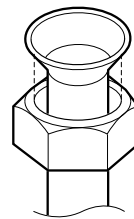
Factor	Flaring works
Troubles & Causes	Gas leaks and connecting troubles on tubings caused by the inaccurate sizing during flaring works.

Defect Details



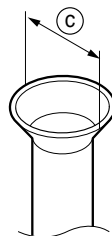
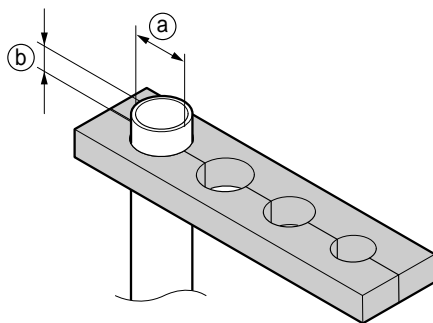
Pipe worked with large sized (b) won't be assembled into the nut.

Pipe worked with small sized (b) will make small contact with nut and gas leak against even a weak shock.



Guidelines

Recommending sizes for several pipes which make proper connectings.



unit:mm

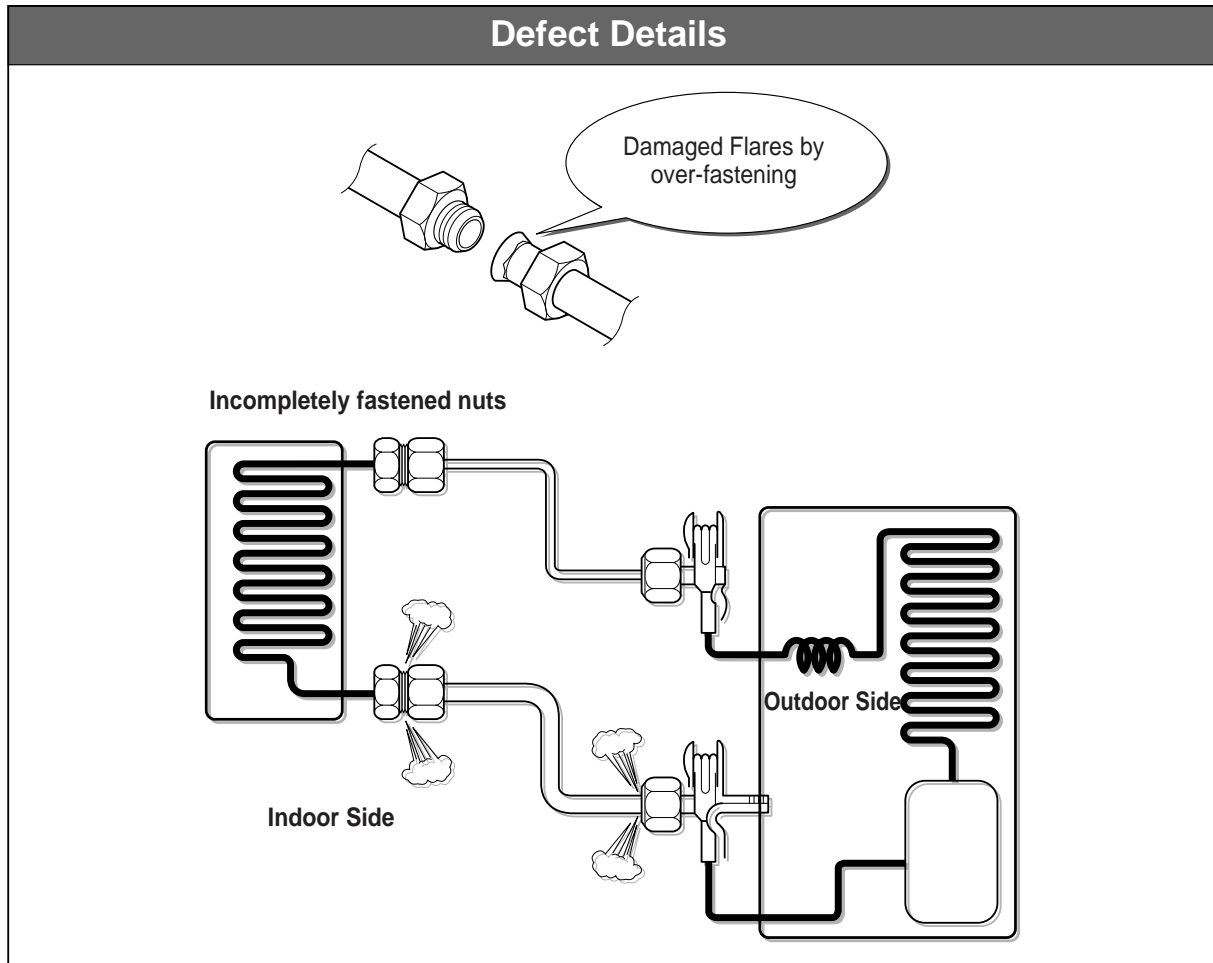
(a) Pipe dia.	(b) Hight	(c) Flared dia.
ø6.35	1.0~1.3	8.3~8.7
ø9.52	0.8~1.0	12.0~12.4
ø12.70	0.5~0.8	15.4~15.8
ø15.8	0.5~0.8	18.6~19.0
ø19.05	0~0.5	23.3~22.9

Leakage /Freon - 4/4

Case-4

Factor	Flare nut's fastening.
Troubles & Causes	Damaged flares by over-fastening make gas leakages. And incompletely fastened nuts too.

Defect Details



Guidelines

■ Fastening Torques of Flare Nuts

Tube Dia.(mm)	Torques (Kg-Cm)
6.35	160~200
9.52	350~450
15.88	450~550
19.05	550~650

■ Torque-wrench is required for proper fastenings.

■ Check gas leakages of 4 fastened points and welded points with soap bubbles etc.

- High pressure points: amid compressor's running.
- Low pressure points: amid compressor's not running.

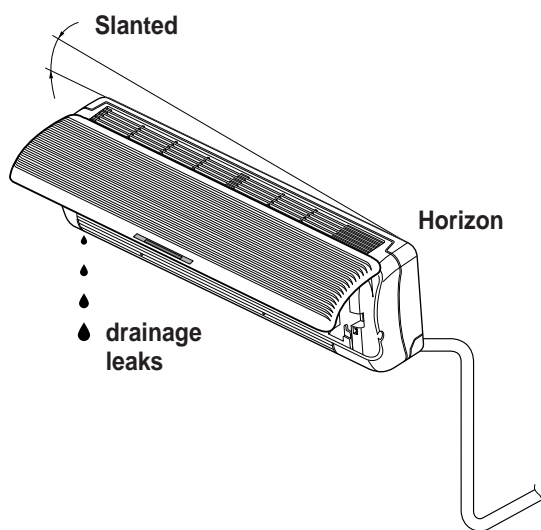
Leakage / Drainage - 1/5

Case-5

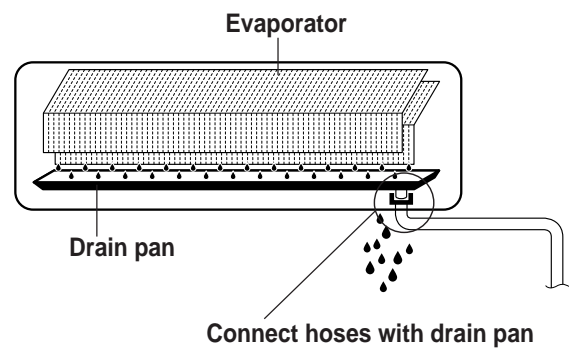
Factor	1. Indoors leveling 2. Drain hose connecting.
Troubles & Causes	Water leaks caused by the inclined indoor unit and the drain hose's bad connecting.

Defect Details

1. Non-leveled indoor



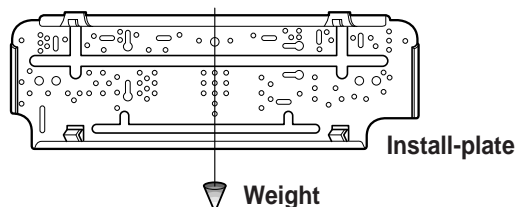
2. Mal-linked drain hose



Guidelines

- Indoors need to be leveled.
(For a better drain the install-plate may be tilted 2~3° to drain-pan's drain side)

- Confirm the water draining is good or not by poring water into the drain pan.
- Connecting parts of drain pan and hose should be well fixed with bond for waterproofing.



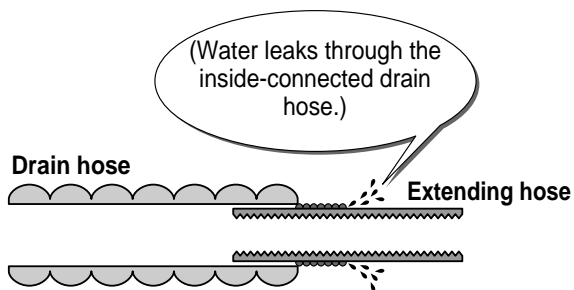
Leakage / Drainage - 2/5

Case-6

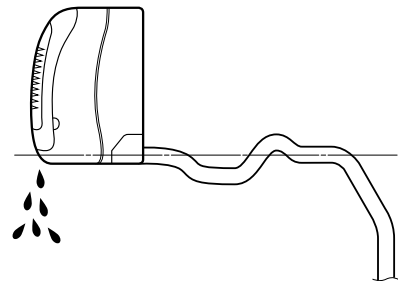
Factor	1. Drain hose extend(adding another hose). 2. Drain hose laying.
Troubles & Causes	Water leaks came from the extending or laying work of drain hose.

Defect Details

1. Improperly extended drain hose.



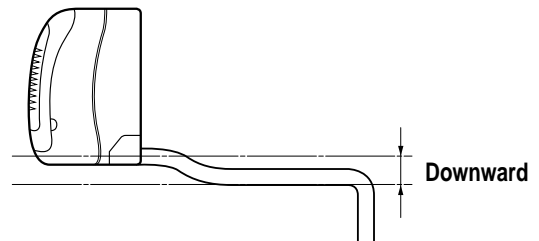
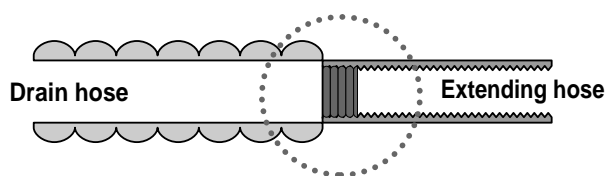
2. Curved or upward drain hose.



Guidelines

- Connect the extending hose outside and seal with bond and finish by taping.

- Install the drain hose straightened and downward.



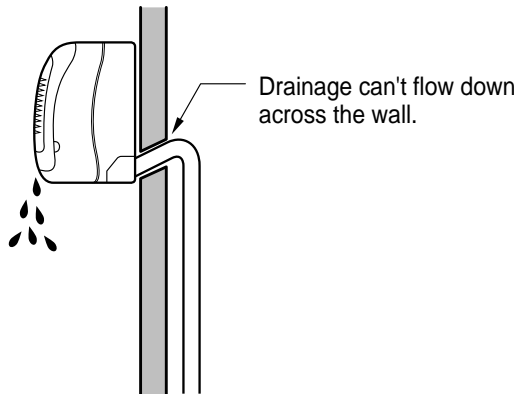
Leakage / Drainage - 3/5

Case-7

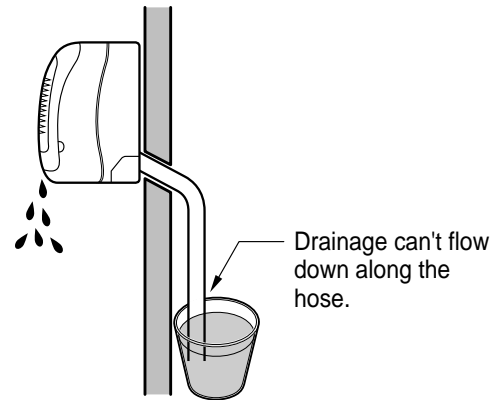
Factor	Drain piping and ending.
Troubles & Causes	Water leaks caused by upwarded drain hose along the wall-through hole and clogged drain hose with water.

Defect Details

1. Upwarded drain hose along the wall-through hole.



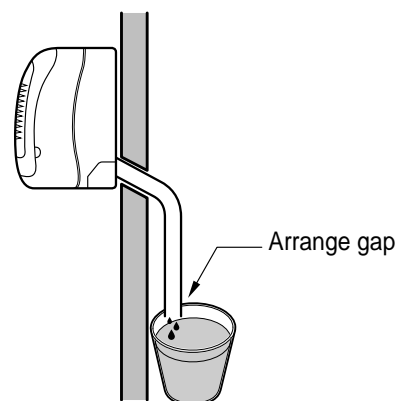
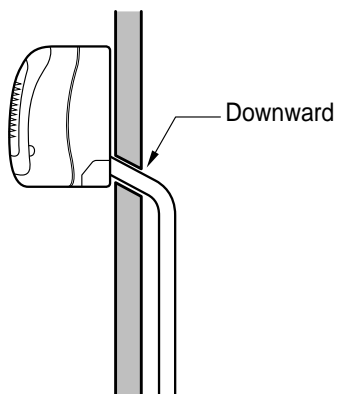
2. Clogged drain hose with water.



Guidelines

■ The wall-through hole should be downward.

■ Don't make drain hose clogged with water.



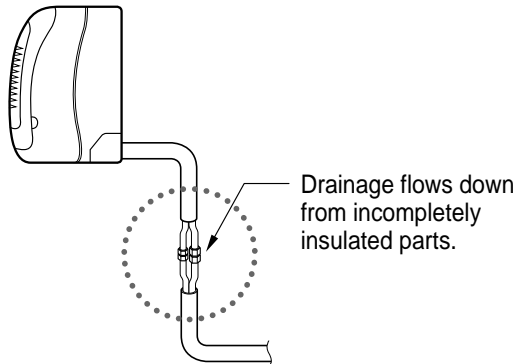
Leakage / Drainage- 4/5

Case-8

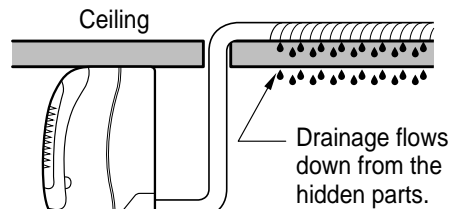
Factor	Insulation work on connecting parts and hidden parts of tubings.
Troubles & Causes	Water leaks caused by wrong insulation works on tubing lines.

Defect Details

1. Incomplete insulation works on tube connecting parts.

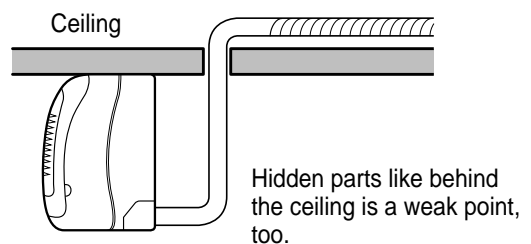
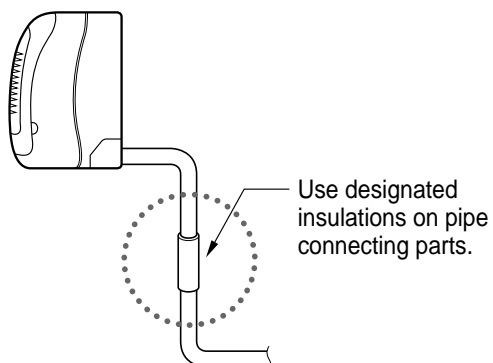


2. Un insulated hidden parts.



Guidelines

■ Completely insulate weak points like pipe-connection and hidden parts.



Leakage / Drainage -5/5

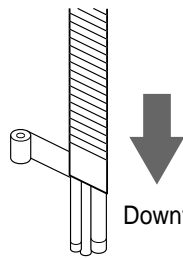
Case-9

Factor	Tubing and taping works against the waterdrops.
Troubles & Causes	Water leaks by the waterdrops led by wrong tubing and taping works.

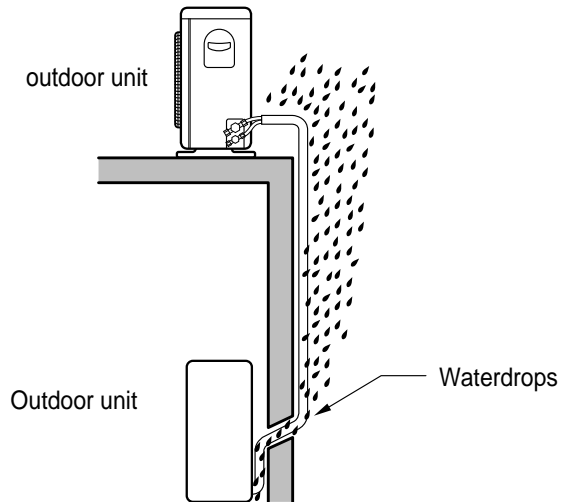
Defect Details

1. Pipe from upside lead waterdrops(rain, drainage etc.) into the room.

2. Wrong taping direction lead waterdrops into the room too.



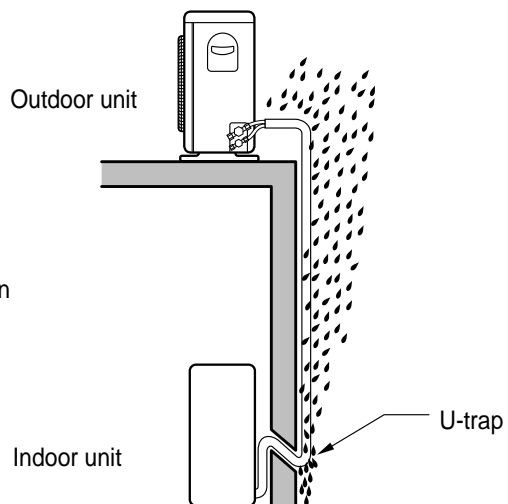
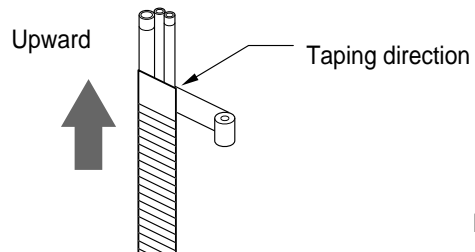
Downward



Guidelines

■ Make U-trap against the waterdrop inflow.

■ tapings should be upward form downside.



Freon shortage

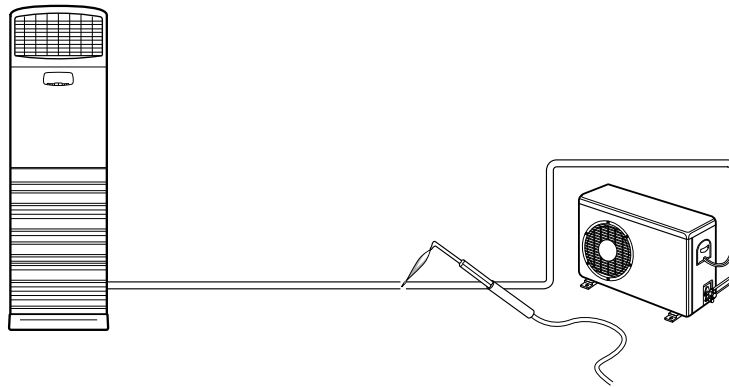
Case-10

Factor	Tube Extending and freon adding.
Troubles & Causes	Cooling capacity downs by the freon shortage.

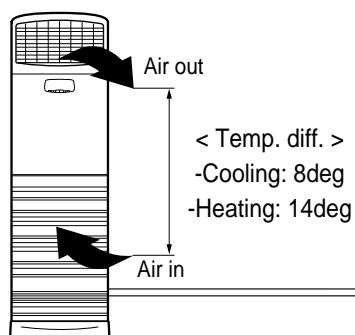
Defect Details

1. Not adding freon for extended tubings.

2. Gas leakage on welded points for extending tubings.

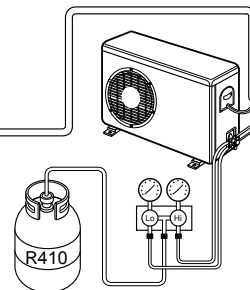


Guidelines



■ Ensure to add freon after extending tubings.(For a simple check of proper freon quantity, compare the in-and-out air temperature after 15 m in from compressor's running.)

■ Detect the gas leakages before insulation tubing(confirm new welded points).



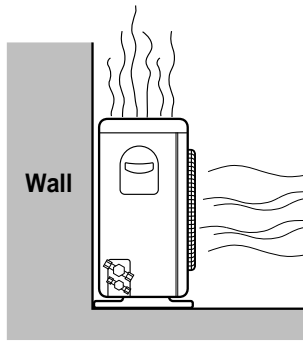
Cooling capacity - 1/5

Case-11

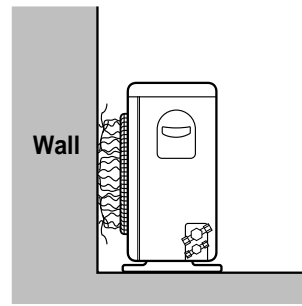
Factor	Spacing for the air flows in split type air conditioners.
Troubles & Causes	Cooling capacity downs by bad air flows.

Defect Details

1. The space for air intake is too narrow.

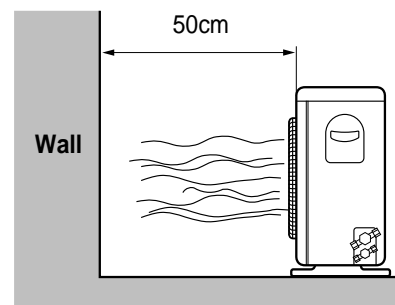
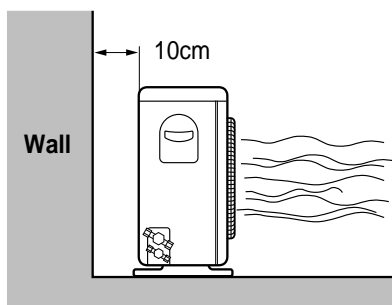


2. The space for air discharge is too narrow.



Guidelines

■ Ensure the distance needed for air flows.



■ Bad air flows lead cooling capacity's drop.
(The product may not run normally as the accumulated heat make compressor stop by protecting device's work like PTC)

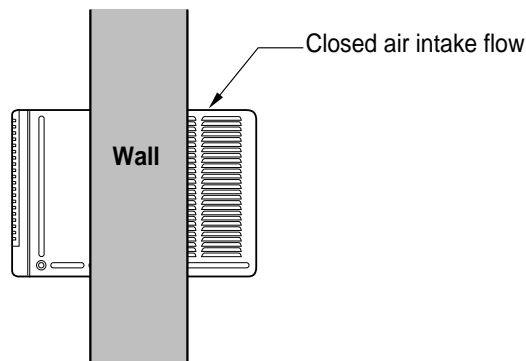
Cooling capacity - 2/5

Case-12

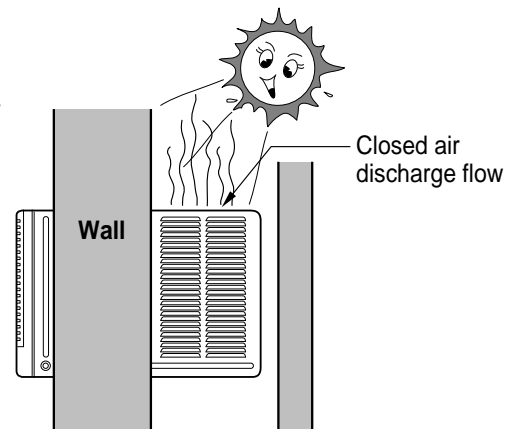
Factor	Spacing for the air flows in window type air conditioners.
Troubles & Causes	Cooling capacity downs by bad air flows.

Defect Details

1. The space for air intake is too narrow.

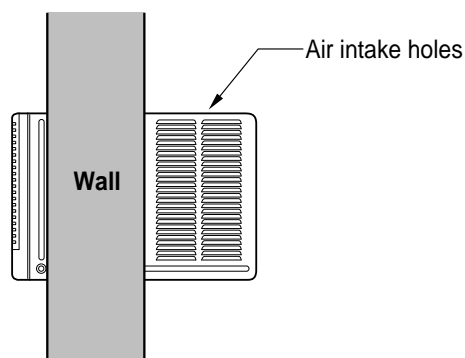


2. The space for air discharge is too narrow.

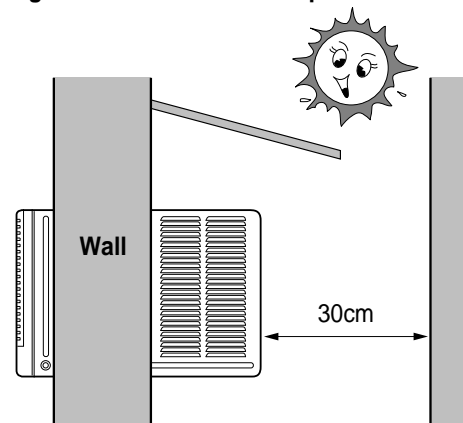


Guidelines

■ Ensure not to disturb the air intake flows.



■ Ensure not to disturb the air discharge flows. The awning is recommended for a optimum cooling.



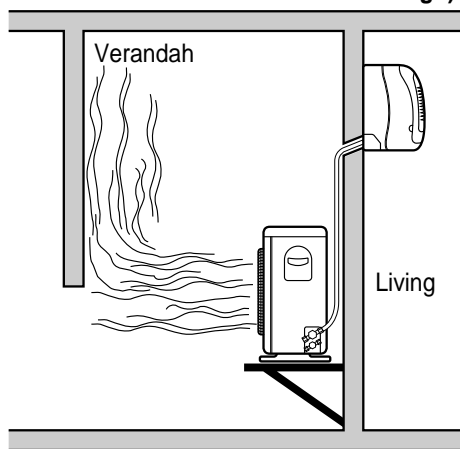
Cooling capacity - 3/5

Case-13

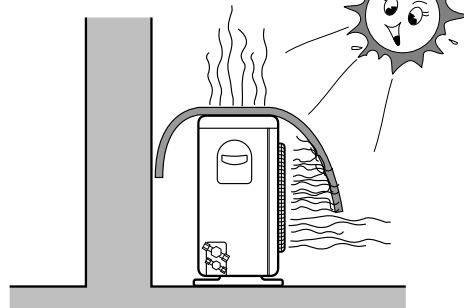
Factor	Improper installation and awning for outdoor unit.
Troubles & Causes	Cooling capacity downs by improper air flows and awning.

Defect Details

1. The outdoor shut in a verandah does not work normally.
(The air around the outdoor unit arise too high)

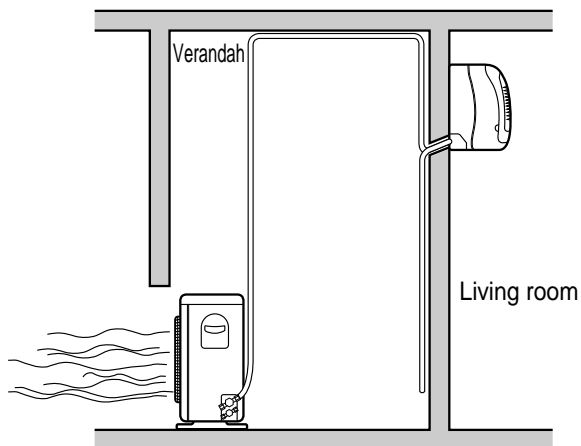


2. Improper awning

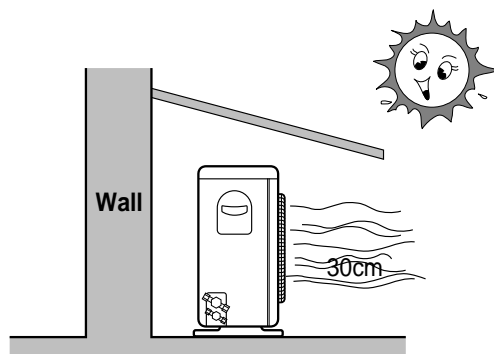


Guidelines

- Discharged air should be outward and not disturbed.



- Establish a proper awning.

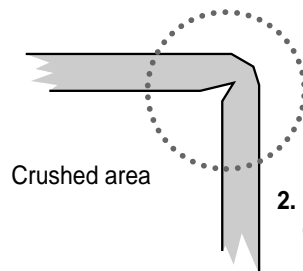


Cooling capacity - 4/5**Case-14**

Factor	Using crushed tubes and changed tubes.
Troubles & Causes	Cooling capacity downs by the crushed tubes and changed tubes.

Defect Details

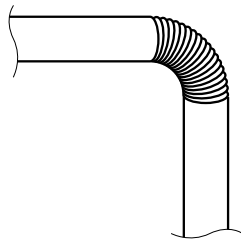
1. Crushed tube by improper bending works.



2. Changed tubing from specified tubes.
(Not using proper tubes designed for each product.)

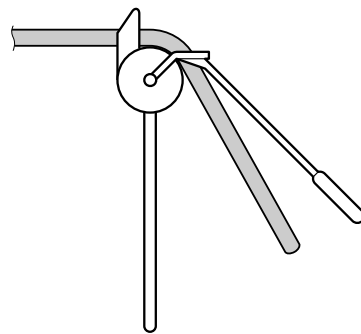
Guidelines

- To get a good shaped tube after bending, use specified spring or bending tools.



(Spring for bending)

- In changing air conditioning unit, the tubes too should be changed with proper ones.



(Bending tool)

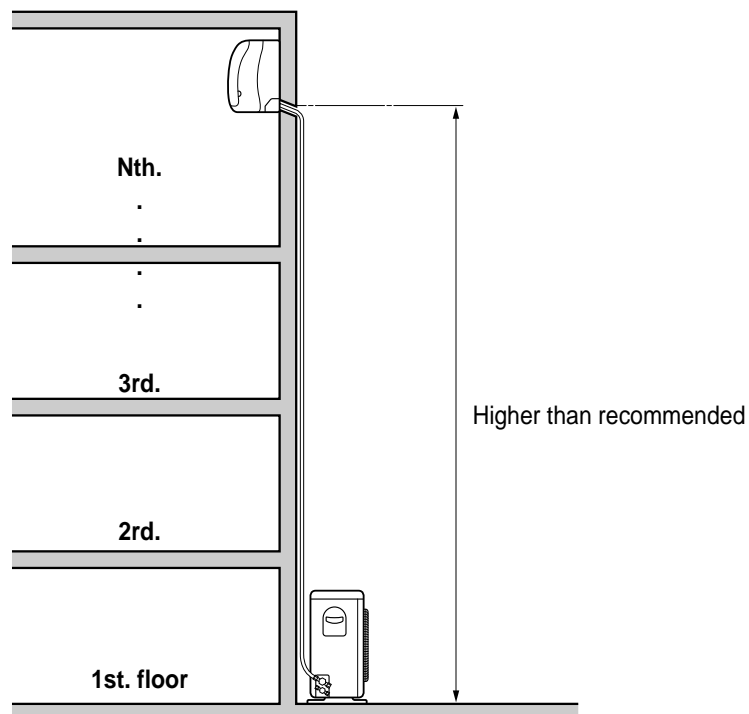
Cooling capacity - 5/5

Case-15

Factor	Long distance tubings.
Troubles & Causes	Cooling capacity downs by long distance tubings.

Defect Details

- Installed too high beyond recommended height difference between indoor and outdoor unit.

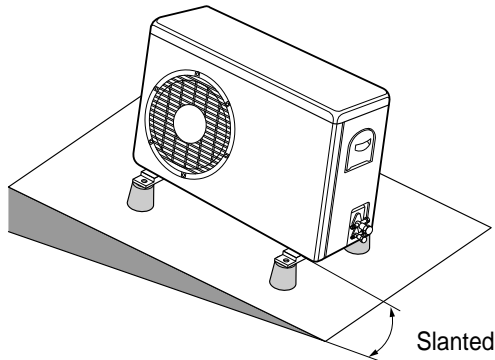
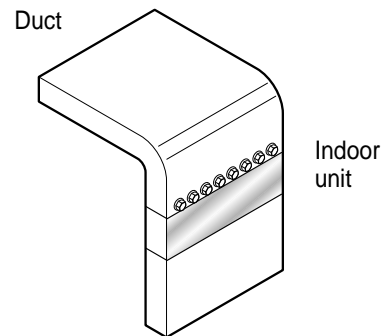


Guidelines

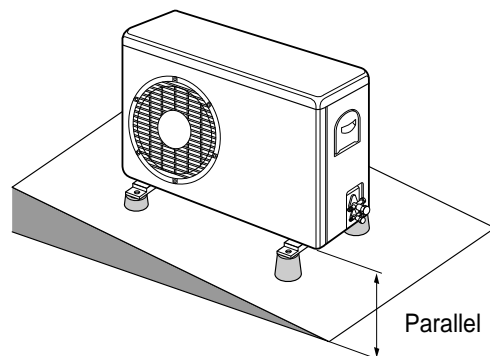
- Recommending maximum distances between indoor and outdoor unit:
- RAC (Split): vertical=5m, horizontal =10m
 - PAC (3.0 HP \varnothing): vertical=5m, horizontal=10m
 - PAC (3.5 Hp \varnothing): vertical=5m, horizontal=20m

Noise - 1/2**Case-16**

Factor	Unstable installing units.
Troubles & Causes	Noise from the unstably installed parts and units.

Defect Details**1. Unstable installed outdoor unit.****2. Released fittings and fasteners.****Guidelines**

- Install the unit balanced stably using specified legs etc.



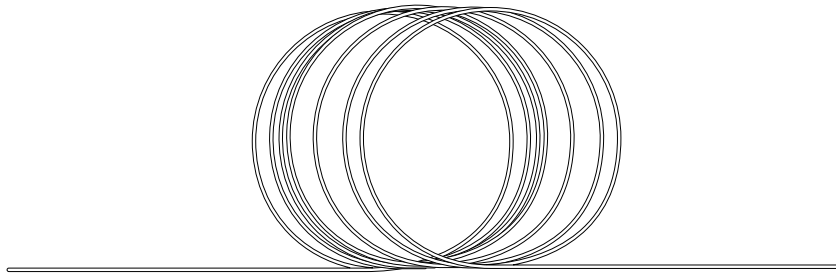
- To prevent vibrations and noises, fasten tightly all the connecting parts for electric heater, steam line, air duct line etc.

Noise - 2/2**Case-17**

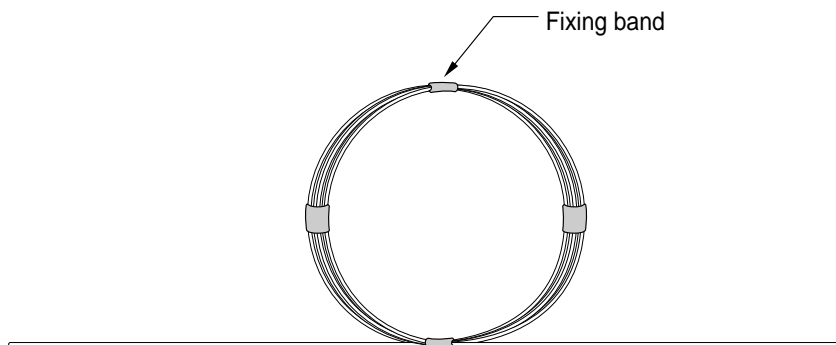
Factor	Unstably fixed tubings.
Troubles & Causes	Noise and vibration form the tubings.

Defect Details

- Unstable fixing of surplus tubings will make vibrations and noises during the compressor's running.

**Guidelines**

- Cut away the surplus tubings.
But if there are any surplus tubings left for some reasons, be sure to fix them stably with fixing bands.



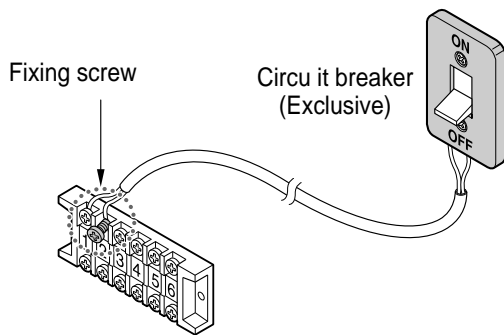
Wiring mistake -1/2

Case-18

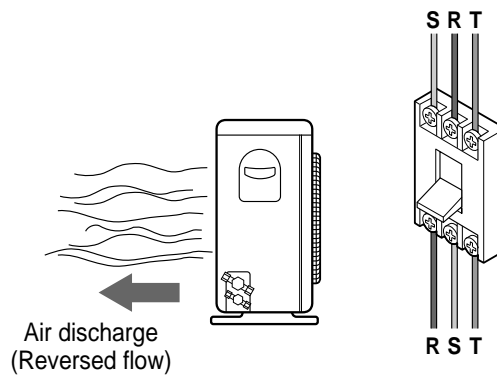
Factor	Wiring in 3 phase electric power lines.
Troubles & Causes	Major electrical problems(not operating properly) by bad wirings.

Defect Details

1. Not firmly fixed screws of electric power lines.(It can be led to critical accidents)

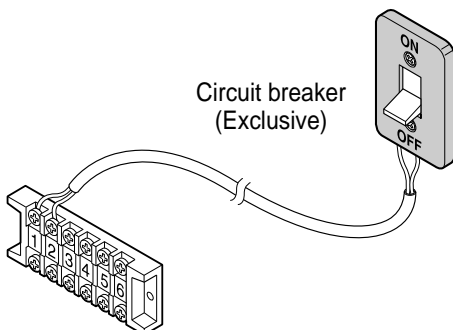


2. Wiring mistake of fan's electric power lines for outdoor.(Fan rotates reversely and the unit will be shutdown with overload.)



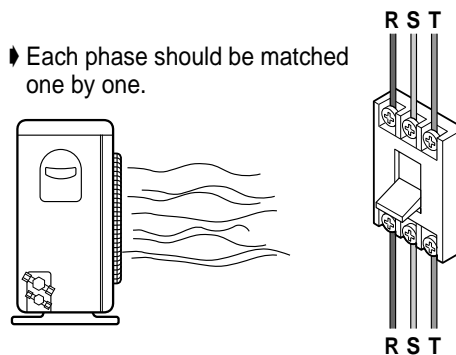
Guidelines

■ Fix screws firmly.



■ Confirm the R-S-T phase lines respectively.

◆ Each phase should be matched one by one.



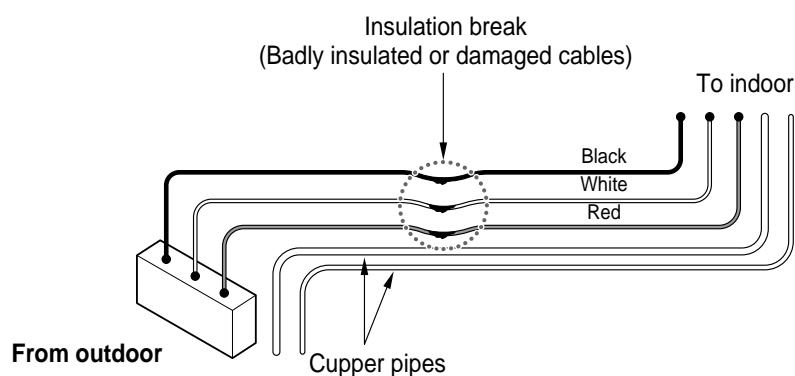
Wiring mistake -2/2

Case-19

Factor	Poor electric insulation.
Troubles & Causes	Major electrical problems(not operating properly) by bad insulations of connecting cables.

Defect Details

■ Poor electric insulations of connecting cables between indoor and outdoor.



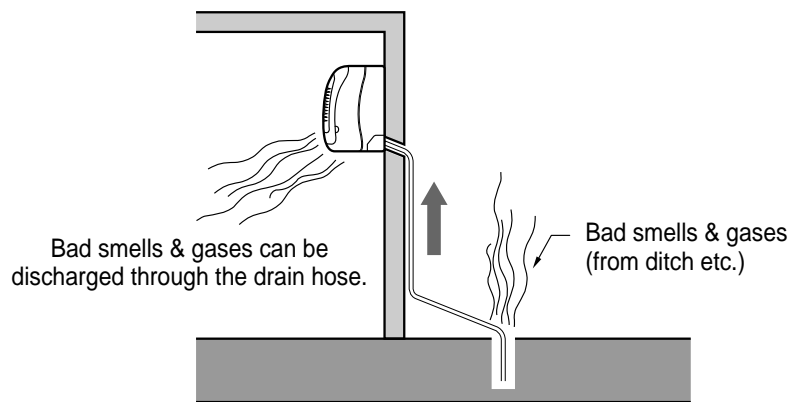
Guidelines

**How to confirm the correct insulations of connecting cables.
(for the troubles be insulation break)**

- Outdoor runs on main electric power's supply.
☐ Short between white and red cables.
- Fuse melts on compressor's running.
☐ Short between red cable and copper pipe.
- Fuse melts on main electric power's supply.
☐ Short between black (or white) cable and copper pipe.
- Main electric braker operates on electric power's supply.
☐ Short between black or white cables.
- Main electric braker operates after 10~20 min from electric power's supply.
☐ Short between black or white cables.
(Occurs after drainage break into badly insulated parts)

Bad smells & Gases**Case-20**

Factor	Bad smells and gases delivered by drain line.
Troubles & Causes	Bad smells and gases from outside(Ex. ditch) are discharged from the system. (Be careful not to be confused as if it's from the system).

Defect Details**■ Discharging bad smells & gases****Guidelines****■ Add trap on the drain line.**